



# Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire Express-A3 SPT-100 Based Propulsion Subsystem and Other Subsystem Flight Operation TM-Data for the Period of October 1, 2000 to and Including December 31, 2000, Task 31

N. Sitnikova, D. Volkov, I. Maximov, and V. Petrusevich  
Nauchno-Proizvodstvennoe Obiedinenie Prikladnoi Mekhaniki, Krasnoyarsk region, Russia

D. Allen  
Schafer Corporation, Chelmsford, Massachusetts

## The NASA STI Program Office . . . in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program Office plays a key part in helping NASA maintain this important role.

The NASA STI Program Office is operated by Langley Research Center, the Lead Center for NASA's scientific and technical information. The NASA STI Program Office provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program Office is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or a major significant phase of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA's counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.
- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.

- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or cosponsored by NASA.
- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that complement the STI Program Office's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results . . . even providing videos.

For more information about the NASA STI Program Office, see the following:

- Access the NASA STI Program Home Page at <http://www.sti.nasa.gov>
- E-mail your question via the Internet to [help@sti.nasa.gov](mailto:help@sti.nasa.gov)
- Fax your question to the NASA Access Help Desk at 301-621-0134
- Telephone the NASA Access Help Desk at 301-621-0390
- Write to:  
NASA Access Help Desk  
NASA Center for Aerospace Information  
7121 Standard Drive  
Hanover, MD 21076



# Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire Express-A3 SPT-100 Based Propulsion Subsystem and Other Subsystem Flight Operation TM-Data for the Period of October 1, 2000 to and Including December 31, 2000, Task 31

N. Sitnikova, D. Volkov, I. Maximov, and V. Petrusevich  
Nauchno-Proizvodstvennoe Obiedinenie Prikladnoi Mekhaniki, Krasnoyarsk region, Russia

D. Allen  
Schafer Corporation, Chelmsford, Massachusetts

Prepared under Contracts NAS3-99151 and NAS3-99204

National Aeronautics and  
Space Administration

Glenn Research Center

Available from

NASA Center for Aerospace Information  
7121 Standard Drive  
Hanover, MD 21076

Available electronically at <http://gltrs.grc.nasa.gov>

## Preface

This 12-part report documents the data obtained from various sensor measurements taken aboard the Russian Express-A2 and Express-A3 spacecraft in Geosynchronous Earth Orbit (GEO). These GEO communications satellites, which were designed and built by NPO Prikladnoy Mekhaniki (NPO PM) of Zheleznogorsk, Russia, utilize Hall thruster propulsion systems for north-south and east-west station-keeping and as of June 2002, were still operating at 80° E. and 11° W., respectively. Express-A2 was launched on March 12, 2000, while Express-A3 was launched on June 24, 2000. The diagnostic equipment from which these data were taken includes electric field strength sensors, ion current and energy sensors, and pressure sensors. The diagnostics and the Hall thruster propulsion systems are described in detail along with lists of tabular data from those diagnostics and propulsion system and other satellite systems.

Space Power, Inc., now part of Pratt & Whitney's Chemical Systems Division, under contract NAS3-99151 to the NASA Glenn Research Center, obtained these data over several periods from March 12, 2000, through September 30, 2001. Each of the 12 individual reports describe, in detail, the propulsion systems as well as the diagnostic sensors utilized.

Finally, parts 11 and 12 include the requirements to which NPO PM prepared and delivered these data.

Filename	Title
<a href="#">CR-2003-212005-PART1.pdf</a>	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire Express-A2 SPT-100 Based Propulsion Subsystem and Other Subsystem Flight Operation TM-Data for the Period of March 12, 2000 to and Including June 15, 2000, Task 29
<a href="#">CR-2003-212005-PART2.pdf</a>	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire TM-Data for Type B Sensors for "Express-A" Number 2 Satellite for the Period of March 12, 2000 to and Including June 15, 2000, Task 25
<a href="#">CR-2003-212005-PART3.pdf</a>	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire Express-A3 SPT-100 Based Propulsion Subsystem and Other Subsystem Flight Operation TM-Data for the Period of June 24, 2000 to and Including September 30, 2000, Task 30
<a href="#">CR-2003-212005-PART4.pdf</a>	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire TM-Data for Type A and Type B Sensors for "Express-A" Number 3 Satellite for the Period of June 24, 2000 to and Including September 30, 2000, Task 27A

<b>Filename</b>	<b>Title</b>
CR-2003-212005-PART5.pdf	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire Express-A3 SPT-100 Based Propulsion Subsystem and Other Subsystem Flight Operation TM-Data for the Period of October 1, 2000 to and Including December 31, 2000, Task 31
<a href="#">CR-2003-212005-PART6.pdf</a>	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire TM-Data for Type A and Type B Sensors for "Express-A" Number 3 Satellite for the Period of October 1, 2000 to and Including December 31, 2000, Task 27B
<a href="#">CR-2003-212005-PART7.pdf</a>	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire Express-A3 SPT-100 Based Propulsion Subsystem and Other Subsystem Flight Operation TM-Data for the Period of January 1, 2001 to and Including March 31, 2001, Task 32
<a href="#">CR-2003-212005-PART8.pdf</a>	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire TM-Data for Type A and Type B Sensors for "Express-A" Number 3 Satellite for the Period of January 1, 2001 to and Including March 31, 2001, Task 27C
<a href="#">CR-2003-212005-PART9.pdf</a>	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire Express-A3 SPT-100 Based Propulsion Subsystem and Other Subsystem Flight Operation TM-Data for the Period of July 1, 2001 to and Including September 30, 2001, Task 33
<a href="#">CR-2003-212005-PART10.pdf</a>	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire TM-Data for Type A and Type B Sensors for "Express-A" Number 3 Satellite for the Period of July 1, 2001 to and Including September 30, 2001, Task 27D
<a href="#">CR-2003-212005-PART11.pdf</a>	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Express/T-160E Project Express A2 and A3 Data Agreement Document
<a href="#">CR-2003-212005-PART12.pdf</a>	Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Express/T-160E Project Express A2 and A3 Sensors Operations Procedures Document

## TABLE OF CONTENTS

<b>ABBREVIATIONS AND ACRONYMS .....</b>	<b>vi</b>
<b>INTRODUCTION.....</b>	<b>1</b>
<b>1. ORBIT CONTROL PROPULSION.....</b>	<b>2</b>
1.1. SPT-100 THRUSTERS FUNCTIONING DATA .....	2
1.2. START-UP AND OPERATION OF THRUSTERS FOR PERFORMING STATION KEEPING OPERATIONS.....	5
1.2.1. Lists of Firing Commands.....	6
1.2.2. Telemetry Data Tables .....	7
1.3. THRUST BASED ON RANGING RESULTS DURING EAST-WEST AND NORTH-SOUTH MANEUVERS.....	8
1.4. COMMENTS ON SPT OPERATION .....	8
<b>2. EXPRESS-A #3 ON-BOARD SUBSYSTEMS .....</b>	<b>9</b>
2.1. POWER SUPPLY SUBSYSTEM .....	9
2.1.1. Temperatures of SA Panels .....	9
2.1.2. Parameters for SA Panels.....	10
2.2. ATTITUDE DETERMINATION AND CONTROL SUBSYSTEM.....	11
2.2.1. Disturbing Torques when operating the SPT-100 Thrusters during the station keeping operations (Firings #1.1 to #1.6 and #1.9).....	11
2.2.2. Disturbing Torques when operating the SPT-100 thrusters during the orbit eccentricity control operations (Firings #1.7 and #1.8).....	11
2.2.3. Attitude Control Propulsion Subsystem.....	12
2.3. Thermal Control Subsystem .....	13
2.4. ON-BOARD NAVIGATION SUBSYSTEM.....	14
2.5. COMMUNICATIONS MODULE.....	14
<b>ANNEX 1.TELEMETRY DATA TABLE WHEN OPERATING THE T4C1         THRUSTER ON 06/10/00 .....</b>	<b>15</b>
<b>ANNEX 2.TELEMETRY DATA TABLE WHEN OPERATING THE T4C1         THRUSTER ON 27/10/00 .....</b>	<b>20</b>
<b>ANNEX 3.TELEMETRY DATA TABLE WHEN OPERATING THE RT4C1         THRUSTER ON 31/10/00 .....</b>	<b>25</b>
<b>ANNEX 4.TELEMETRY DATA TABLE WHEN OPERATING THE T4C1         THRUSTER ON 15/11/00 .....</b>	<b>30</b>
<b>ANNEX 5.TELEMETRY DATA TABLE WHEN OPERATING THE T4C1         THRUSTER ON 25/11/00 .....</b>	<b>36</b>
<b>ANNEX 6.TELEMETRY DATA TABLE WHEN OPERATING THE RT4C1         THRUSTER ON 29/11/00 .....</b>	<b>41</b>
<b>ANNEX 7.TELEMETRY DATA TABLE WHEN OPERATING THE RT1C1         THRUSTER ON 04/12/00 .....</b>	<b>48</b>
<b>ANNEX 8.TELEMETRY DATA TABLE WHEN OPERATING THE RT2C1         THRUSTER ON 05/12/00 .....</b>	<b>53</b>
<b>ANNEX 9.TELEMETRY DATA TABLE WHEN OPERATING THE RT4C1         THRUSTER ON 21/12/00 .....</b>	<b>59</b>

## Abbreviations and Acronyms

<b>A</b>	Amps
<b>DK</b>	Pressure of Xenon Feed Unit output
<b>DKR1</b>	Pressure of primary Xenon Feed Branch
<b>DKR2</b>	Pressure of redundant Xenon Feed Branch
<b>DVK</b>	Pressure of Xenon Feed Unit input
<b>EV</b>	Electrical valve
<b>EWSK</b>	East-West Station Keeping
<b>Hn</b>	Heater number "n"
<b>HETS</b>	Hall Effect Thruster System
<b>I</b>	Current
<b>NSSK</b>	North-South Station Keeping
<b>PPU</b>	Power Processing Unit
<b>PRD</b>	Pressure regulation device
<b>PS</b>	Propulsion System
<b>PV</b>	Pyrotechnic Valve
<b>RT</b>	Redundant Thruster
<b>RV</b>	Reducing Valve
<b>SA</b>	Solar Array
<b>SAn</b>	Solar Array Panel number "n"
<b>SPT-100</b>	Stationary Plasma Thruster with 100 mm
<b>T</b>	Thruster
<b>T18R</b>	Temperature 1 of the Cylindrical Radiator
<b>T19R</b>	Temperature 2 of the Cylindrical Radiator
<b>T1PK</b>	Temperature of Xenon Feed Unit
<b>T1SA</b>	Temperature of Solar Array Panel number 1
<b>T28K</b>	Temperature of the Pressurized Container Surface
<b>T2SA</b>	Temperature of Solar Array Panel number 2
<b>TBHKn</b>	Temperature of Xenon Storage Unit number "n"
<b>TBK<sub>n</sub></b>	Temperature of Thruster number "n"
<b>TUn</b>	Thruster Unit number "n"
<b>V</b>	Voltage, Volts
<b>Vn</b>	Valve number "n"
<b>XFU</b>	Xenon Feed Unit
<b>XSun</b>	Xenon Storage Unit number "n"



## **Introduction**

The Express-A #3 Spacecraft has been entered into geostationary orbit on June 24, 2000. The spacecraft's electric jet propulsion based on the SPT-100 stationary plasma thrusters is used to provide both the longitude and inclination orbit control.

This Report is issued in accordance with the requirements of the Task #31 under the Contract #97-1088-02 and prepared in compliance with agreed upon contents of the sections of the "EXPRESS/T160E Project Express A2 and A3 Data Agreement Document dated on October 29, 2000" document.

This Document includes the flight operational data for the SPT-100 Propulsion at level of the Express-A #3 Spacecraft for a period of October 01 to December 31, 2000.

In this Document all the being measured parameters and their changes are referenced to Moscow Standard Time.

# 1. Orbit Control Propulsion

## 1.1. SPT-100 Thrusters Functioning Data

For a period of October 01 through December 31, 2000, the SPT-100 Thrusters firings were conducted to perform the following tasks:

- From 02/10/00 to 31/12/00: performing the longitude/inclination station keeping operations for the Express-A #3 Spacecraft,
- On 04/12/00 and 05/12/00: performing the operations to control an orbit eccentricity.

Total operating time and number of firings for each thruster on each cathode for the period of October 01 to December 31, 2000 are provided in Table 1.

Table 1

Thruster No	Cathode No	Firing duration, hh:mm:ss	Firing number
T1	C1	00:00:00	0
T1	C2	00:00:00	0
RT1	C1	01:25:00	1
RT1	C2	00:00:00	0
T2	C1	00:00:00	0
T2	C2	00:00:00	0
RT2	C1	01:30:00	1
RT2	C2	00:00:00	0
T3	C1	00:00:00	0
T3	C2	00:00:00	0
RT3	C1	00:00:00	0
RT3	C2	00:00:00	0
T4	C1	50:22:49	35
T4	C2	00:00:00	0
RT4	C1	58:59:58	43
RT4	C2	00:00:00	0

Data for each SPT-100 firing and its duration for the reported period are provided in Table 2.

Table 2

Date (dd/mm/yy)	Thruster No	Cathode No	Operating Time (hh:mm:ss)
02/10/00	T4	C1	01:10:57
03/10/00	T4	C1	01:10:57
04/10/00	RT4	C1	01:10:58
05/10/00	RT4	C1	01:10:58
06/10/00	T4	C1	01:10:58
07/10/00	RT4	C1	01:10:59
08/10/00	T4	C1	01:11:00
09/10/00	RT4	C1	01:11:00
10/10/00	T4	C1	01:11:00
11/10/00	RT4	C1	01:11:01
12/10/00	T4	C1	01:11:01
13/10/00	RT4	C1	01:11:01
16/10/00	T4	C1	01:11:04
17/10/00	RT4	C1	01:11:04
18/10/00	RT4	C1	01:11:05
19/10/00	T4	C1	01:11:04

<b>Date (dd/mm/yy)</b>	<b>Thruster No</b>	<b>Cathode No</b>	<b>Operating Time (hh:mm:ss)</b>
20/10/00	T4	C1	01:11:05
21/10/00	RT4	C1	01:11:06
22/10/00	T4	C1	01:11:06
23/10/00	RT4	C1	01:11:07
24/10/00	T4	C1	01:11:07
25/10/00	RT4	C1	01:11:08
26/10/00	RT4	C1	01:11:08
27/10/00	T4	C1	01:11:09
30/10/00	RT4	C1	01:11:10
31/10/00	RT4	C1	01:11:11
01/11/00	RT4	C1	01:11:11
02/11/00	T4	C1	01:11:11
03/11/00	RT4	C1	01:11:12
04/11/00	RT4	C1	01:11:12
05/11/00	RT4	C1	01:11:13
06/11/00	T4	C1	01:11:14
07/11/00	RT4	C1	01:11:14
08/11/00	T4	C1	01:11:14
09/11/00	RT4	C1	01:11:14
10/11/00	T4	C1	01:11:15
13/11/00	T4	C1	01:09:49
14/11/00	RT4	C1	01:09:50
15/11/00	T4	C1	02:00:00
16/11/00	RT4	C1	02:00:00
17/11/00	RT4	C1	01:09:51
18/11/00	T4	C1	02:00:00
19/11/00	RT4	C1	01:09:52
20/11/00	T4	C1	01:09:53
21/11/00	RT4	C1	01:09:53
22/11/00	RT4	C1	01:09:54
23/11/00	T4	C1	01:09:54
24/11/00	RT4	C1	01:09:55
25/11/00	T4	C1	01:09:55
26/11/00	RT4	C1	01:09:55
29/11/00	RT4	C1	02:00:00
30/11/00	RT4	C1	01:11:24
01/12/00	RT4	C1	01:11:25
02/12/00	RT4	C1	01:11:26
03/12/00	RT4	C1	01:11:26
04/12/00	RT1	C1	01:25:00
05/12/00	RT2	C1	01:30:00
05/12/00	RT4	C1	01:11:27
06/12/00	RT4	C1	01:11:28
07/12/00	T4	C1	01:11:28
08/12/00	T4	C1	01:11:29
09/12/00	T4	C1	01:11:29
10/12/00	T4	C1	01:11:30
13/12/00	T4	C1	02:00:00
14/12/00	RT4	C1	02:00:00
15/12/00	T4	C1	02:00:00
16/12/00	RT4	C1	02:00:00
17/12/00	T4	C1	02:00:00
18/12/00	RT4	C1	02:00:00

<b>Date (dd/mm/yy)</b>	<b>Thruster No</b>	<b>Cathode No</b>	<b>Operating Time (hh:mm:ss)</b>
19/12/00	T4	C1	02:00:00
20/12/00	RT4	C1	02:00:00
21/12/00	RT4	C1	02:00:00
22/12/00	T4	C1	02:00:00
23/12/00	RT4	C1	02:00:00
24/12/00	RT4	C1	02:00:00
27/12/00	T4	C1	02:00:00
28/12/00	T4	C1	02:00:00
29/12/00	T4	C1	02:00:00
30/12/00	T4	C1	02:00:00
31/12/00	RT4	C1	02:00:00

## ***1.2. Start-up and operation of thrusters for performing station keeping operations***

SPT-100 Thruster Flight Operation Data when performing the station keeping operations is provided for the following firings:

# 1.1)	Thruster:	T4C1
	Date and Time of switching on:	06/10/00 at 20:45:24;
	Date and Time of switching off:	06/10/00 at 21:56:22.
	Operating Time:	01:10:58.
# 1.2)	Thruster:	T4C1
	Date and Time of switching on:	27/10/00 at 19:22:56;
	Date and Time of switching off:	27/10/00 at 20:34:05.
	Operating Time:	01:11:09.
# 1.3)	Thruster:	RT4C1
	Date and Time of switching on:	31/10/00 at 19:06:56;
	Date and Time of switching off:	31/10/00 at 20:18:07.
	Operating Time:	01:11:11.
# 1.4)	Thruster:	T4C1
	Date and Time of switching on:	15/11/00 at 16:57:05;
	Date and Time of switching off:	15/11/00 at 18:57:05.
	Operating Time:	02:00:00.
# 1.5)	Thruster:	T4C1
	Date and Time of switching on:	25/11/00 at 17:29:48;
	Date and Time of switching off:	25/11/00 at 18:39:43.
	Operating Time:	01:09:55.
# 1.6)	Thruster:	RT4C1
	Date and Time of switching on:	29/11/00 at 16:49:44;
	Date and Time of switching off:	29/11/00 at 18:49:44.
	Operating Time:	02:00:00.
# 1.7)	Thruster:	RT1C1
	Date and Time of switching on:	04/12/00 at 18:49:44;
	Date and Time of switching off:	04/12/00 at 20:14:44.
	Operating Time:	01:25:00.
# 1.8)	Thruster:	RT2C1
	Date and Time of switching on:	05/12/00 at 05:59:44;
	Date and Time of switching off:	05/12/00 at 07:29:44.
	Operating Time:	01:30:00.
# 1.9)	Thruster:	RT4C1
	Date and Time of switching on:	21/12/00 at 15:22:04;
	Date and Time of switching off:	21/12/00 at 17:22:04.
	Operating Time:	02:00:00.

### 1.2.1. Lists of Firing Commands

Sequence of commands for firing the thrusters #1.1 to #1.6 and date and time of their execution are provided in Table 3. Sequence of commands for firing the thrusters #1.7 to #1.9 and date and time of their execution are provided in Table 4.

Table 3

Command	Date and Time of Execution					
	# 1.1 06/10/00	# 1.2 27/10/00	# 1.3 31/10/00	# 1.4 15/11/00	# 1.5 25/11/00	# 1.6 29/11/00
Channel “minus Z”	20:40:44	19:18:16	19:02:16	16:52:24	17:25:08	16:45:04
RV1 Opening	20:40:44	19:18:16	19:02:16	16:52:24	17:25:08	16:45:04
T (RT) Preparation	20:42:44	19:20:16	19:04:16	16:54:24	17:27:09	16:47:04
C Preparation	20:42:46	19:20:19	19:04:18	16:54:26	17:27:10	16:47:06
T Valves Opening	20:45:16	19:21:48	19:06:48	16:56:56	17:29:40	16:49:36
Ignition	20:45:24	19:22:56	19:06:56	16:57:04	17:29:48	16:49:44
C Switching Off	20:45:24	19:22:56	19:06:56	16:57:05	17:29:48	16:49:44
RV Closing	21:46:22	20:24:05	20:08:07	18:47:05	18:29:43	18:39:44
T Switching Off	21:56:22	20:34:05	20:18:07	18:57:05	18:39:43	18:49:44

Table 4

Command	Date and Time of Execution			Comments
	# 1.7 04/12/00	# 1.8 05/12/00	# 1.9 21/12/00	
Channel “i”	18:45:04	05:55:04	15:17:24	When Firing 1.7 i = minus Y; When Firing 1.8 i = minus Y; When Firing 1.9 i = minus Z.
RV1 Opening	18:45:04	05:55:04	15:17:24	
T (RT) Preparation	18:47:04	05:57:04	15:19:24	
C Preparation	18:47:06	05:57:06	15:19:26	
T Valves Opening	18:49:36	05:59:36	15:21:56	
Ignition	18:49:44	05:59:44	15:22:04	
C Switching Off	18:49:44	05:59:44	15:22:04	
RV Closing	20:04:44	07:19:44	17:12:04	
T Switching Off	20:14:44	07:29:44	17:22:04	

### *1.2.2. Telemetry Data Tables*

- #1.1) Telemetry data table when operating the T4C1 Thruster on 06/10/00 is given in Annex 1.
- #1.2) Telemetry data table when operating the T4C1 Thruster on 27/10/00 is given in Annex 2.
- #1.3) Telemetry data table when operating the RT4C1 Thruster on 31/10/00 is given in Annex 3.
- #1.4) Telemetry data table when operating the T4C1 Thruster on 15/11/00 is given in Annex 4.
- #1.5) Telemetry data table when operating the T4C1 Thruster on 25/11/00 is given in Annex 5.
- #1.6) Telemetry data table when operating the RT4C1 Thruster on 29/11/00 is given in Annex 6.
- #1.7) Telemetry data table when operating the RT1C1 Thruster on 04/12/00 is given in Annex 7.
- #1.8) Telemetry data table when operating the RT2C1 Thruster on 05/12/00 is given in Annex 8.
- #1.9) Telemetry data table when operating the RT4C1 Thruster on 21/12/00 is given in Annex 9.

### ***1.3. Thrust based on ranging results during East-West and North-South maneuvers***

Effective thrust determination results for Express-A #3 Orbit Control Propulsion Subsystem are given in Table 5.

Table 5

<b>Ascertain Thruster Operating Period</b>	<b>Ascertain Thruster No</b>	<b>Effective Thrust, mN</b>
19.09 - 27.10.2000	T4, RT4	80,5
30.10 - 10.11.2000	T4, RT4	71,3
13 - 26.11.2000	T4, RT4	65,5
29.11 - 10.12.2000	T4, RT4	78,8
13 - 24.12.2000	T4, RT4	78,5

For the North-South orbit control thrusters T4 and RT4 when determining a mean-integral value of effective thrust it was assumed that thrust values of all thrusters at all firings to be fell in a measurement interval are equal. In this case the measurement interval is a time period between two ranging cycles, of which there are performed SPT-100 thruster firings.

The longer the measurement interval, the higher an accuracy of mean-integral thrust value calculation. This is clarified as follows: the longer the measurement interval, the greater the change of orbit parameters due to the SPT-100 thruster firings, and accordingly, the lesser an influence of possible uncertainties when determining the orbit parameters based on the ranging data.

### ***1.4. Comments on SPT Operation***

No any comments on SPT-100 operation within the period of 01/10/00 to 31/12/00 are recorded. All the operations on the Express-A #3 Orbit Control Propulsion Subsystem were performed in accordance with the specified logic and no any additional measures were taken.



## 2. Express-A #3 On-Board Subsystems

### 2.1. Power Supply Subsystem

#### 2.1.1. Temperatures of SA Panels

Table 6 provides the SA temperature variations for a day of 21/12/00.

Table 6

Time	SA Panel 1 Temperature ( °C)	SA Panel 2 Temperature ( °C)
00:00:00	38,3	37,2
01:00:00	37,2	36,0
02:00:00	37,2	36,0
03:00:00	38,3	36,0
04:00:00	38,3	36,0
05:00:00	38,3	37,2
06:00:00	39,4	37,2
07:00:00	33,8	37,2
08:00:00	39,4	37,2
09:00:00	38,3	37,2
10:00:00	40,1	34,9
11:00:00	39,4	37,2
12:00:00	39,4	37,2
13:00:00	41,7	37,2
14:00:00	41,7	38,3
15:00:00	40,6	38,3
16:00:00	36,0	37,2
17:00:00	36,0	37,2
18:00:00	37,2	37,2
19:00:00	38,3	37,2
20:00:00	38,3	38,3
21:00:00	38,3	39,4
22:00:00	37,2	36,0
23:00:00	38,3	38,3
23:59:59	39,4	37,2

### 2.1.2.Parameters for SA Panels

Table 7 provides information on parameters for the SA panels. They were measured once per month during a flight operation of the Express-A #3 satellite.

Table 7

Date & Time of Measurement	Panels SA1 & SA2		Panel SA3		Panel SA4	
	I <sub>CC</sub> (A)	U <sub>OC</sub> (V)	I <sub>CC</sub> (A)	U <sub>OC</sub> (V)	I <sub>CC</sub> (A)	U <sub>OC</sub> (V)
25/10/00 10:50	105,3	47,2	17,9	46,6	17,9	46,6
27/11/00 11:40	100,3	46,4	17,0	45,8	17,2	45,8
21/12/00 15:15	99,1	46,3	16,8	45,8	17,0	45,8

Notes:

1. I<sub>CC</sub> is SA output current.
2. U<sub>OC</sub> is open-circuit voltage.
3. Output currents for the SA1 and SA2 sections are measured at voltage of 30,3 V; for the SA3 and SA4 sections - at 27,8 V.
4. Steps of measurement are:
  - Current of SA1 and SA2 Sections are: 0,7 A,
  - Current of SA3 and SA4 Sections are: 0,2 A,
  - Voltage: 0.3 V.

## 2.2. Attitude Determination and Control Subsystem

### 2.2.1. Disturbing Torques when operating the SPT-100 Thrusters during the station keeping operations (Firings #1.1 to #1.6 and #1.9)

Values of the disturbing torques ( $M_x$ ,  $M_y$ ,  $M_z$ ) observable when operating the SPT-100 thrusters are provided in Table 8.

Table 8

Thruster #	Cathode #	SA Angle (degrees)	Data (dd/mm/yy)	Disturbing Torque X (N·m)	Disturbing Torque Y (N·m)	Disturbing Torque Z (N·m)
T4	C1	180	06.10.2000	-1.29E-03	2.77E-03	2.61E-04
T4	C1	150	27.10.2000	-3.63E-03	-1.12E-04	-1.21E-04
		165	27.10.2000	-2.88E-03	1.20E-03	-2.52E-05
RT4	C1	150	31.10.2000	-2.56E-03	-1.44E-03	-3.05E-04
T4	C1	120	15.11.2000	-3.21E-03	-2.61E-03	-3.18E-04
		135	15.11.2000	-3.62E-03	-1.56E-03	-2.62E-04
T4	C1	120	25.11.2000	-3.18E-03	-2.80E-03	-3.25E-04
		135	25.11.2000	-3.60E-03	-1.59E-03	-2.81E-04
RT4	C1	105	29.11.2000	-6.99E-04	-4.54E-03	2.07E-04
		120	29.11.2000	-2.07E-03	-4.14E-03	-5.69E-05
		135	29.11.2000	-2.60E-03	-3.26E-03	-1.81E-04
RT4	C1	90	21.12.2000	1.37E-04	-4.19E-03	1.24E-04
		105	21.12.2000	-9.65E-04	-4.36E-03	2.31E-05

### 2.2.2. Disturbing Torques when operating the SPT-100 thrusters during the orbit eccentricity control operations (Firings #1.7 and #1.8)

Values of the disturbing torques ( $M_x$ ,  $M_y$ ,  $M_z$ ) observable when operating the SPT-100 thrusters are provided in Table 9.

Table 9

Thruster #	Cathode #	SA Angle (degrees)	Data (dd/mm/yy)	Disturbing Torque X (N·m)	Disturbing Torque Y (N·m)	Disturbing Torque Z (N·m)
RT1	C1	135-150	04/12/00	1.42E-03	-1.22E-04	-6.65E-04
RT2	C1	315-330	05/12/00	-1.06E-03	-2.63E-04	7.44E-05

### 2.2.3. Attitude Control Propulsion Subsystem

A propellant flow rate for the Express-A #3 Attitude Control Propulsion Subsystem in order to compensate the disturbing torques at the firings #1.1 through #1.9 is given in Table 10.

Table 10

<b>Firing No</b>	<b>Thruster No</b>	<b>Propellant Flow Rate (grams)</b>
1.1	T4C1	$\approx 4,6$
1.2	T4C1	$\approx 4,8$
1.3	RT4C1	$\approx 5,3$
1.4	T4C1	$\approx 14,7$
1.5	T4C1	$\approx 7,3$
1.6	RT4C1	$\approx 13$
1.7	RT1C1	$\approx 0$
1.8	RT2C1	$\approx 2,5$
1.9	RT4C1	$\approx 8,6$

### 2.3. Thermal Control Subsystem

Table 11 provides daily temperature change data (Parameters T18R and T19R) for the Radiator as well as for a surface of the Pressurized Container (T28K). The parameters were measured on December 21, 2000 with an interval of 60 min.

Table 11

Time (hh:mm:ss)	Cylindrical Radiator Temperature 1 (°C)	Cylindrical Radiator Temperature 2 (°C)	Pressurized Container Surface Temperature (°C)
00:00:00	-9,67	-17,26	16,04
01:00:01	-12,2	-18,95	16,04
02:00:01	-16,42	-21,48	15,38
03:00:01	-21,48	-23,17	15,05
04:00:01	-24,01	-21,48	14,39
05:00:01	-24,01	-18,95	14,39
06:00:01	-22,32	-14,73	14,06
07:00:01	-18,95	-11,36	14,06
08:00:01	-16,42	-8,83	14,39
09:00:00	-15,58	-5,45	14,39
10:00:00	-13,89	-4,61	14,39
11:00:00	-12,2	-3,77	14,39
12:00:00	-11,36	-3,77	14,72
13:00:00	-10,51	-3,77	14,72
14:00:00	-10,51	-5,45	14,72
15:00:01	-11,36	-8,83	14,72
16:00:01	-10,51	-10,51	15,38
17:00:01	-7,98	-11,36	15,71
18:00:00	-5,45	-10,51	16,37
19:00:00	-4,61	-10,51	16,04
20:00:01	-2,92	-7,14	16,37
21:00:01	-3,77	-12,2	16,37
22:00:01	-5,45	-13,89	16,7
23:00:01	-6,3	-14,73	16,37
16:00:01	-17,26	-23,17	14,39
17:00:01	-14,73	-23,17	14,06
18:00:01	-11,36	-21,48	14,39
19:00:01	-8,83	-19,79	15,05
20:00:01	-7,14	-18,11	15,38
21:00:01	-7,14	-18,95	15,71
22:00:01	-8,83	-20,64	16,04
23:00:01	-9,67	-22,32	16,37
23:59:59	-9,67	-20,64	16,37

## ***2.4. On-Board Navigation Subsystem***

Express-A #3 orbit parameters on the date of ranging session are provided in Table 12 below.

Table 12

<b>Date of Ranging Session</b>	<b>Time (Moscow Standard Time )</b>	<b>Greenwich Longitude</b>	<b>Inclination</b>
14.10.2000	02.14.06	11.00.36 W	00.03.17,5
28.10.2000	01.18.52	10.59.48 W	00.03.51,2
11.11.2000	00.23.54	10.59.04 W	00.03.57,6
27.11.2000	23.16.49	10.55.16 W	00.03.40,4
11.12.2000	22.22.19	11.03.29 W	00.03.26,2
25.12.2000	21.27.20	11.04.31 W	00.04.05,3

## ***2.5. Communications Module***

Within a period of 01/10/00 to 31/12/00 when firing the SPT-100 Thrusters no any facts of anomalous telemetry data receipt were registered.

Within a period of 01/10/00 to 31/12/00 when firing the SPT-100 thrusters, an influence of propulsion on the communications module transponders operation performance was not recorded.

**Annex 1. T4C1 Thruster Operation TM-data based on available TM-data receipt sessions (06/10/00)**

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
20:39:54	0,00	0,00	0,00	2,81	
20:40:04	0,00	0,00	0,00	2,81	
20:40:14	0,00	0,00	0,00	2,81	
20:40:24	0,00	0,00	0,00	2,81	
20:40:34	0,00	0,00	0,00	2,81	
20:40:44	0,00	0,00	0,00	2,81	
20:40:54	0,00	0,00	0,00	2,81	
20:41:04	0,00	0,00	0,00	2,81	
20:41:14	0,00	0,00	0,00	2,81	
20:41:24	0,00	0,00	0,00	2,81	
20:41:34	0,00	0,00	0,00	2,81	
20:41:44	0,00	0,00	0,00	2,81	
20:41:54	0,00	0,00	0,00	2,81	
20:42:05	0,00	0,00	0,00	2,81	
20:42:14	0,00	0,00	0,00	2,81	
20:42:24	0,00	0,00	0,00	2,81	
20:42:34	0,00	0,00	0,00	2,81	
20:42:44	0,00	0,00	0,00	2,81	
20:42:54	11,90	0,00	326	2,81	
20:43:04	12,10	0,00	326	2,81	
20:43:14	12,00	0,00	326	2,81	
20:43:24	12,10	0,00	326	2,81	
20:43:34	12,00	0,00	326	2,81	
20:43:44	11,90	0,00	326	2,81	
20:43:54	12,00	0,00	326	2,81	
20:44:04	12,20	0,00	326	2,81	
20:44:14	12,10	0,00	326	2,81	
20:44:24	12,00	0,00	326	2,81	
20:44:35	12,00	0,00	326	2,81	
20:44:45	12,00	0,00	326	2,81	
20:44:54	12,00	0,00	326	2,81	
20:45:04	12,00	0,00	326	2,81	
20:45:14	12,20	0,00	326	2,81	
20:45:24	12,20	3,82	310	2,81	
20:45:34	0,00	4,46	308	2,78	
20:46:14	0,00	4,65	308	2,72	
20:46:34	0,00	4,87	308	2,72	
20:47:34	0,00	4,74	308	2,63	
20:48:14	0,00	4,68	305	2,78	
20:48:34	0,00	4,65	308	2,75	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
20:49:14	0,00	4,62	316	2,72	
20:49:34	0,00	4,62	310	2,66	
20:50:14	0,00	4,68	314	2,63	
20:50:34	0,00	4,65	310	2,63	
20:51:14	0,00	4,71	308	2,84	
20:51:34	0,00	4,62	310	2,78	
20:52:14	0,00	4,65	310	2,72	
20:52:34	0,00	4,65	318	2,72	
20:53:14	0,00	4,65	314	2,69	
20:53:34	0,00	4,74	310	2,63	
20:54:14	0,00	4,65	314	2,78	
20:54:34	0,00	4,68	316	2,84	
20:55:14	0,00	4,65	310	2,75	
20:55:34	0,00	4,65	310	2,69	
20:56:14	0,00	4,68	310	2,66	
20:56:34	0,00	4,65	318	2,63	
20:57:14	0,00	4,68	314	2,72	
20:58:14	0,00	4,65	310	2,75	
20:58:34	0,00	4,65	310	2,75	
20:59:14	0,00	4,65	310	2,69	
20:59:34	0,00	4,68	310	2,69	
21:00:14	0,00	4,77	310	2,63	
21:00:34	0,00	4,77	308	2,75	
21:01:14	0,00	4,68	310	2,78	
21:01:34	0,00	4,65	310	2,75	
21:02:14	0,00	4,68	308	2,69	
21:03:14	0,00	4,77	310	2,63	
21:03:34	0,00	4,62	316	2,69	
21:04:14	0,00	4,77	310	2,81	
21:04:34	0,00	4,65	308	2,78	
21:05:34	0,00	4,68	310	2,66	
21:06:14	0,00	4,74	308	2,63	
21:06:34	0,00	4,65	310	2,60	
21:07:14	0,00	4,68	310	2,84	
21:07:34	0,00	4,77	310	2,78	
21:08:14	0,00	4,65	308	2,72	
21:08:34	0,00	4,65	308	2,72	
21:09:14	0,00	4,65	310	2,66	
21:09:34	0,00	4,65	310	2,63	
21:10:14	0,00	4,68	310	2,84	
21:10:34	0,00	4,65	316	2,81	
21:11:14	0,00	4,65	316	2,75	
21:11:34	0,00	4,65	318	2,72	
21:12:14	0,00	4,62	310	2,66	



Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
21:12:34	0,00	4,65	318	2,66	
21:13:14	0,00	4,77	310	2,75	
21:13:34	0,00	4,74	308	2,84	
21:14:14	0,00	4,65	310	2,75	
21:14:34	0,00	4,65	310	2,72	
21:15:14	0,00	4,62	314	2,69	
21:16:14	0,00	4,77	310	2,63	
21:16:34	0,00	4,68	310	2,78	
21:17:14	0,00	4,62	310	2,78	
21:17:34	0,00	4,62	310	2,75	
21:18:14	0,00	4,74	308	2,69	
21:18:34	0,00	4,65	318	2,66	
21:19:14	0,00	4,74	308	2,63	
21:19:34	0,00	4,74	308	2,72	
21:20:14	0,00	4,62	310	2,81	
21:21:14	0,00	4,62	310	2,72	
21:21:34	0,00	4,62	310	2,66	
21:22:14	0,00	4,62	310	2,63	
21:22:34	0,00	4,62	318	2,60	
21:23:34	0,00	4,65	314	2,78	
21:24:14	0,00	4,62	310	2,72	
21:24:34	0,00	4,62	308	2,69	
21:25:14	0,00	4,74	308	2,66	
21:25:34	0,00	4,65	308	2,66	
21:26:14	0,00	4,65	318	2,81	
21:26:34	0,00	4,65	310	2,84	
21:27:14	0,00	4,62	310	2,75	
21:27:34	0,00	4,65	308	2,72	
21:28:14	0,00	4,62	318	2,66	
21:28:34	0,00	4,65	308	2,66	
21:29:14	0,00	4,62	308	2,72	
21:29:34	0,00	4,62	308	2,84	
21:30:14	0,00	4,65	308	2,75	
21:30:34	0,00	4,65	308	2,75	
21:31:14	0,00	4,65	308	2,69	
21:31:34	0,00	4,65	314	2,66	
21:32:14	0,00	4,65	308	2,63	
21:32:34	0,00	4,65	310	2,78	
21:33:14	0,00	4,62	310	2,78	
21:34:14	0,00	4,68	310	2,69	
21:34:34	0,00	4,71	308	2,69	
21:35:14	0,00	4,65	308	2,63	
21:35:34	0,00	4,71	308	2,66	
21:36:14	0,00	4,68	308	2,81	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
21:36:34	0,00	4,74	310	2,78	
21:37:14	0,00	4,62	308	2,72	
21:37:34	0,00	4,68	308	2,69	
21:38:14	0,00	4,65	310	2,63	
21:39:14	0,00	4,71	308	2,84	
21:39:34	0,00	4,77	310	2,81	
21:40:14	0,00	4,65	312	2,75	
21:40:34	0,00	4,65	318	2,72	
21:41:34	0,00	4,68	308	2,63	
21:42:14	0,00	4,65	308	2,78	
21:42:34	0,00	4,62	310	2,84	
21:43:14	0,00	4,62	310	2,75	
21:43:34	0,00	4,65	314	2,72	
21:44:14	0,00	4,71	308	2,66	
21:44:34	0,00	4,65	308	2,66	
21:45:14	0,00	4,62	310	2,66	
21:45:34	0,00	4,65	310	2,84	
21:46:14	0,00	4,62	310	2,78	
21:46:34	0,00	4,65	314	2,78	
21:47:14	0,00	4,74	308	2,69	
21:47:34	0,00	4,77	310	2,66	
21:48:14	0,00	4,65	308	2,60	
21:48:34	0,00	4,65	308	2,75	
21:49:14	0,00	4,65	316	2,78	
21:49:34	0,00	4,65	308	2,78	
21:50:14	0,00	4,65	316	2,72	
21:50:34	0,00	4,71	308	2,66	
21:51:14	0,00	4,77	308	2,63	
21:52:14	0,00	4,65	308	2,84	
21:52:34	0,00	4,65	308	2,78	
21:53:14	0,00	4,65	310	2,72	
21:53:34	0,00	4,74	308	2,69	
21:54:14	0,00	4,74	308	2,63	
21:54:34	0,00	4,65	326	2,63	
21:55:14	0,00	4,71	308	2,84	
21:55:34	0,00	4,62	312	2,81	
21:56:14	0,00	4,74	310	2,75	
21:56:34	0,00	0,00	0	2,72	
21:57:14	0,00	0,00	0	2,72	

Time hh:mm:ss	Xe Feed Unit Input	Primary Xe Feed Branch	Redundant Xe Feed Branch	Xe Storage Unit 1	Xe Storage Unit 2	Xe Storage Unit 3	Xe Feed Unit	Thruster Unit 4
Pressure (kgf/cm <sup>2</sup> )				Temperature (°C)				
20:31:45	56,36	4,88	3,87	10,10	10,63	9,58	9,00	11,36
21:38:46	56,36	4,88	3,87	10,10	10,63	9,58	9,00	14,68
21:51:41	56,36	4,81	3,87	10,10	10,63	9,58	9,00	14,68
21:52:15	56,36	4,95	3,87	10,10	10,63	9,58	9,00	14,68
21:55:07	56,36	4,74	3,87	10,10	10,63	9,58	9,00	14,68
21:55:23	56,36	4,88	3,87	10,10	10,63	9,58	9,00	14,68

**Annex 2. T4C1 Thruster Operation TM-data based on available TM-data receipt sessions (27/10/00)**

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
19:18:06	0,00	0,00	0,00	2,81	
19:18:16	0,00	0,00	0,00	2,81	
19:18:26	0,00	0,00	0,00	2,81	
19:18:36	0,00	0,00	0,00	2,81	
19:18:46	0,00	0,00	0,00	2,81	
19:18:56	0,00	0,00	0,00	2,81	
19:19:06	0,00	0,00	0,00	2,81	
19:19:16	0,00	0,00	0,00	2,81	
19:19:26	0,00	0,00	0,00	2,81	
19:19:36	0,00	0,00	0,00	2,81	
19:19:46	0,00	0,00	0,00	2,81	
19:19:56	0,00	0,00	0,00	2,81	
19:20:06	0,00	0,00	0,00	2,81	
19:20:16	0,00	0,00	324	2,81	
19:20:26	12,00	0,00	326	2,81	
19:20:36	12,00	0,00	326	2,81	
19:20:46	12,20	0,00	326	2,81	
19:20:56	12,10	0,00	322	2,81	
19:21:06	12,00	0,00	326	2,81	
19:21:16	12,00	0,00	324	2,81	
19:21:26	12,00	0,00	324	2,81	
19:21:36	12,10	0,00	326	2,81	
19:21:46	12,00	0,00	326	2,81	
19:21:56	12,20	0,00	326	2,81	
19:22:06	12,00	0,00	326	2,81	
19:22:16	12,10	0,00	324	2,81	
19:22:26	12,00	0,00	326	2,81	
19:22:36	12,00	0,00	326	2,81	
19:22:46	12,00	0,00	326	2,81	
19:22:56	12,00	0,00	326	2,81	
19:23:06	0,00	3,52	310	2,78	
19:23:36	0,00	4,09	310	2,75	
19:24:06	0,00	4,59	308	2,69	
19:24:36	0,00	4,74	308	2,66	
19:25:06	0,00	4,65	316	2,63	
19:25:36	0,00	4,65	308	2,72	
19:26:06	0,00	4,65	308	2,84	
19:26:36	0,00	4,74	308	2,75	
19:27:06	0,00	4,65	316	2,72	
19:27:36	0,00	4,68	310	2,66	
19:28:06	0,00	4,87	310	2,63	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
19:28:36	0,00	4,77	308	2,63	
19:29:06	0,00	4,77	308	2,63	
19:29:36	0,00	4,65	308	2,78	
19:30:06	0,00	4,65	310	2,75	
19:30:36	0,00	4,65	314	2,69	
19:31:06	0,00	4,65	310	2,69	
19:32:06	0,00	4,74	310	2,78	
19:32:36	0,00	4,62	310	2,81	
19:33:06	0,00	4,65	310	2,75	
19:33:36	0,00	4,65	310	2,72	
19:34:36	0,00	4,65	318	2,63	
19:35:06	0,00	4,65	308	2,69	
19:35:36	0,00	4,68	314	2,81	
19:36:06	0,00	4,65	310	2,75	
19:36:36	0,00	4,74	308	2,72	
19:37:06	0,00	4,65	318	2,66	
19:37:36	0,00	4,68	310	2,66	
19:38:06	0,00	4,77	310	2,60	
19:38:36	0,00	4,71	308	2,84	
19:39:06	0,00	4,74	308	2,78	
19:39:36	0,00	4,62	308	2,75	
19:40:06	0,00	4,68	310	2,72	
19:40:36	0,00	4,68	314	2,66	
19:41:06	0,00	4,65	310	2,63	
19:41:36	0,00	4,74	308	2,75	
19:42:06	0,00	4,65	318	2,84	
19:42:36	0,00	4,71	310	2,75	
19:43:06	0,00	4,65	318	2,72	
19:43:36	0,00	4,68	308	2,66	
19:44:06	0,00	4,68	308	2,63	
19:44:36	0,00	4,77	310	2,66	
19:45:06	0,00	4,62	310	2,84	
19:45:36	0,00	4,74	308	2,78	
19:46:06	0,00	4,65	308	2,75	
19:46:36	0,00	4,65	318	2,69	
19:47:36	0,00	4,62	310	2,63	
19:48:06	0,00	4,65	310	2,78	
19:48:36	0,00	4,65	318	2,84	
19:49:06	0,00	4,65	316	2,72	
19:50:06	0,00	4,77	310	2,69	
19:50:36	0,00	4,62	314	2,63	
19:51:06	0,00	4,62	312	2,72	
19:51:36	0,00	4,68	308	2,84	
19:52:36	0,00	4,77	308	2,72	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
19:53:06	0,00	4,77	310	2,66	
19:53:36	0,00	4,68	310	2,66	
19:54:06	0,00	4,74	308	2,60	
19:54:36	0,00	4,74	308	2,84	
19:55:06	0,00	4,77	308	2,78	
19:55:36	0,00	4,68	308	2,75	
19:56:06	0,00	4,65	308	2,72	
19:56:36	0,00	4,65	326	2,66	
19:57:06	0,00	4,62	310	2,60	
19:57:36	0,00	4,65	310	2,75	
19:58:06	0,00	4,65	308	2,81	
19:58:36	0,00	4,65	316	2,75	
19:59:06	0,00	4,77	310	2,72	
19:59:36	0,00	4,62	310	2,66	
20:00:06	0,00	4,65	308	2,63	
20:00:36	0,00	4,62	310	2,66	
20:01:06	0,00	4,65	318	2,84	
20:01:36	0,00	4,65	314	2,78	
20:02:06	0,00	4,71	308	2,72	
20:02:36	0,00	4,62	310	2,69	
20:03:06	0,00	4,68	308	2,66	
20:03:36	0,00	4,65	308	2,63	
20:04:06	0,00	4,74	308	2,81	
20:04:36	0,00	4,65	316	2,78	
20:05:36	0,00	4,77	310	2,72	
20:06:06	0,00	4,87	310	2,66	
20:06:36	0,00	4,62	310	2,63	
20:07:06	0,00	4,65	314	2,72	
20:08:06	0,00	4,77	310	2,75	
20:08:36	0,00	4,62	310	2,72	
20:09:06	0,00	4,65	318	2,69	
20:09:36	0,00	4,68	310	2,66	
20:10:36	0,00	4,77	308	2,84	
20:11:06	0,00	4,65	316	2,78	
20:11:36	0,00	4,77	310	2,75	
20:12:06	0,00	4,65	310	2,69	
20:12:36	0,00	4,65	308	2,66	
20:13:06	0,00	4,62	318	2,63	
20:13:36	0,00	4,65	308	2,75	
20:14:06	0,00	4,62	308	2,81	
20:14:36	0,00	4,65	316	2,75	
20:15:06	0,00	4,74	310	2,72	
20:15:36	0,00	4,65	308	2,69	
20:16:06	0,00	4,74	308	2,63	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
20:16:36	0,00	4,77	308	2,66	
20:17:06	0,00	4,74	308	2,84	
20:17:36	0,00	4,65	308	2,78	
20:18:06	0,00	4,62	310	2,72	
20:18:36	0,00	4,62	318	2,69	
20:19:06	0,00	4,65	316	2,66	
20:19:36	0,00	4,65	318	2,63	
20:20:06	0,00	4,87	310	2,81	
20:20:36	0,00	4,65	308	2,78	
20:21:06	0,00	4,65	308	2,75	
20:21:36	0,00	4,65	308	2,72	
20:22:06	0,00	4,77	308	2,66	
20:22:36	0,00	4,74	308	2,63	
20:23:36	0,00	4,74	308	2,84	
20:24:06	0,00	4,77	308	2,75	
20:24:36	0,00	4,77	310	2,72	
20:25:06	0,00	4,65	308	2,69	
20:25:36	0,00	4,65	308	2,69	
20:26:06	0,00	4,65	310	2,60	
20:26:36	0,00	4,62	318	2,84	
20:27:06	0,00	4,74	310	2,78	
20:27:36	0,00	4,65	308	2,75	
20:28:06	0,00	4,65	308	2,69	
20:28:36	0,00	4,65	308	2,69	
20:29:06	0,00	4,77	308	2,63	
20:29:36	0,00	4,65	308	2,75	
20:30:06	0,00	4,65	308	2,84	
20:30:36	0,00	4,65	308	2,75	
20:31:06	0,00	4,77	308	2,75	
20:31:36	0,00	4,77	310	2,72	
20:32:06	0,00	4,65	308	2,69	
20:32:36	0,00	4,65	310	2,60	
20:33:06	0,00	4,62	318	2,84	
20:33:36	0,00	4,74	310	2,78	
20:34:06	0,00	0,00	0,00	2,75	
20:34:36	0,00	0,00	0,00	2,75	

Time hh:mm:ss	Xe Feed Unit Input	Primary Xe Feed Branch	Redundant Xe Feed Branch	Xe Storage Unit 1	Xe Storage Unit 2	Xe Storage Unit 3	Xe Feed Unit	Thruster Unit 4
	Pressure (kgf/cm <sup>2</sup> )			Temperature (°C)				
19:19:45	57,68	4,88	3,95	10,63	11,15	11,15	10,05	15,35
20:18:08	57,68	4,88	3,95	10,63	11,15	11,15	10,05	18,68
20:29:30	57,68	4,88	3,95	10,63	11,15	11,15	10,05	18,68
20:30:00	57,68	4,95	3,95	10,63	11,15	11,15	10,05	18,68
20:32:43	57,68	4,81	3,95	10,63	11,15	11,15	10,05	18,68
20:33:09	57,68	4,88	3,95	10,63	11,15	11,15	10,05	18,68



**Annex 3. RT4C1 Thruster Operation TM-data based on available TM-data receipt sessions (31/10/00)**

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
19:01:36	0,00	0,00	0,00	2,81	
19:01:46	0,00	0,00	0,00	2,81	
19:01:56	0,00	0,00	0,00	2,81	
19:02:06	0,00	0,00	0,00	2,81	
19:02:16	0,00	0,00	0,00	2,81	
19:02:26	0,00	0,00	0,00	2,81	
19:02:36	0,00	0,00	0,00	2,81	
19:02:46	0,00	0,00	0,00	2,81	
19:02:56	0,00	0,00	0,00	2,81	
19:03:06	0,00	0,00	0,00	2,81	
19:03:16	0,00	0,00	0,00	2,81	
19:03:26	0,00	0,00	0,00	2,81	
19:03:36	0,00	0,00	0,00	2,81	
19:03:46	0,00	0,00	0,00	2,81	
19:03:56	0,00	0,00	0,00	2,81	
19:04:06	0,00	0,00	0,00	2,81	
19:04:16	0,00	0,00	328	2,81	
19:04:26	12,10	0,00	322	2,81	
19:04:36	11,90	0,00	322	2,81	
19:04:46	12,00	0,00	322	2,81	
19:04:56	12,00	0,00	322	2,81	
19:05:06	12,00	0,00	322	2,81	
19:05:16	11,90	0,00	322	2,81	
19:05:26	12,00	0,00	322	2,81	
19:05:36	12,00	0,00	322	2,81	
19:05:46	12,00	0,00	322	2,81	
19:05:56	12,30	0,00	322	2,81	
19:06:06	12,20	0,00	322	2,81	
19:06:16	12,10	0,00	322	2,81	
19:06:26	12,10	0,00	322	2,81	
19:06:36	12,10	0,00	322	2,81	
19:06:46	12,00	0,00	322	2,81	
19:06:56	12,00	0,00	322	2,81	
19:07:06	0,00	3,82	308	2,78	
19:07:16	0,00	4,56	308	2,75	
19:07:46	0,00	4,59	308	2,72	
19:08:16	0,00	4,65	310	2,66	
19:08:46	0,00	4,62	308	2,66	
19:09:16	0,00	4,65	312	2,81	
19:09:46	0,00	4,62	314	2,78	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
19:10:16	0,00	4,65	310	2,72	
19:10:46	0,00	4,74	310	2,69	
19:11:16	0,00	4,65	308	2,66	
19:11:46	0,00	4,65	308	2,60	
19:12:16	0,00	4,68	308	2,84	
19:12:46	0,00	4,68	308	2,78	
19:13:16	0,00	4,65	308	2,75	
19:13:46	0,00	4,65	308	2,69	
19:14:16	0,00	4,68	308	2,66	
19:14:46	0,00	4,68	308	2,63	
19:15:16	0,00	4,62	305	2,75	
19:15:46	0,00	4,65	318	2,81	
19:16:16	0,00	4,65	308	2,72	
19:16:46	0,00	4,65	308	2,69	
19:17:16	0,00	4,62	310	2,66	
19:17:46	0,00	4,68	305	2,63	
19:18:16	0,00	4,65	308	2,72	
19:19:16	0,00	4,62	308	2,75	
19:19:46	0,00	4,62	308	2,72	
19:20:16	0,00	4,71	308	2,66	
19:20:46	0,00	4,62	308	2,63	
19:21:46	0,00	4,68	308	2,84	
19:22:16	0,00	4,65	308	2,78	
19:22:46	0,00	4,65	308	2,72	
19:23:16	0,00	4,62	308	2,69	
19:23:46	0,00	4,62	308	2,69	
19:24:16	0,00	4,65	314	2,63	
19:24:46	0,00	4,65	318	2,78	
19:25:16	0,00	4,62	308	2,81	
19:25:46	0,00	4,68	310	2,75	
19:26:16	0,00	4,65	310	2,72	
19:26:46	0,00	4,65	308	2,66	
19:27:16	0,00	4,65	318	2,63	
19:27:46	0,00	4,62	308	2,72	
19:28:16	0,00	4,62	310	2,84	
19:28:46	0,00	4,65	308	2,75	
19:29:16	0,00	4,62	308	2,72	
19:29:46	0,00	4,62	308	2,66	
19:30:16	0,00	4,62	308	2,66	
19:30:46	0,00	4,65	308	2,63	
19:31:16	0,00	4,62	310	2,84	
19:31:46	0,00	4,62	308	2,78	
19:32:16	0,00	4,65	316	2,75	
19:32:46	0,00	4,62	308	2,69	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
19:33:16	0,00	4,77	308	2,66	
19:33:46	0,00	4,65	308	2,63	
19:34:46	0,00	4,65	308	2,81	
19:35:16	0,00	4,65	308	2,72	
19:35:46	0,00	4,65	308	2,72	
19:36:16	0,00	4,65	308	2,66	
19:37:16	0,00	4,77	308	2,69	
19:37:46	0,00	4,62	308	2,84	
19:38:16	0,00	4,62	308	2,75	
19:38:46	0,00	4,62	308	2,72	
19:39:46	0,00	4,62	310	2,66	
19:40:16	0,00	4,74	310	2,60	
19:40:46	0,00	4,65	308	2,84	
19:41:16	0,00	4,74	308	2,78	
19:41:46	0,00	4,65	316	2,75	
19:42:16	0,00	4,65	308	2,72	
19:42:46	0,00	4,62	308	2,66	
19:43:16	0,00	4,65	308	2,63	
19:43:46	0,00	4,65	305	2,75	
19:44:16	0,00	4,62	308	2,81	
19:44:46	0,00	4,77	308	2,75	
19:45:16	0,00	4,62	308	2,72	
19:45:46	0,00	4,77	308	2,66	
19:46:16	0,00	4,68	308	2,63	
19:46:46	0,00	4,65	305	2,66	
19:47:16	0,00	4,65	308	2,84	
19:47:46	0,00	4,62	308	2,78	
19:48:16	0,00	4,65	316	2,72	
19:48:46	0,00	4,62	308	2,69	
19:49:16	0,00	4,65	308	2,63	
19:49:46	0,00	4,62	310	2,60	
19:50:16	0,00	4,62	308	2,84	
19:50:46	0,00	4,77	308	2,78	
19:51:16	0,00	4,65	305	2,75	
19:51:46	0,00	4,62	310	2,72	
19:52:46	0,00	4,62	308	2,63	
19:53:16	0,00	4,62	318	2,75	
19:53:46	0,00	4,65	310	2,84	
19:54:16	0,00	4,65	308	2,75	
19:55:16	0,00	4,62	308	2,69	
19:55:46	0,00	4,65	308	2,63	
19:56:16	0,00	4,62	308	2,69	
19:56:46	0,00	4,77	312	2,84	
19:57:46	0,00	4,62	310	2,75	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
19:58:16	0,00	4,65	308	2,72	
19:58:46	0,00	4,65	308	2,66	
19:59:16	0,00	4,62	308	2,63	
19:59:46	0,00	4,59	318	2,81	
20:00:16	0,00	4,62	308	2,78	
20:00:46	0,00	4,65	316	2,75	
20:01:16	0,00	4,65	316	2,72	
20:01:46	0,00	4,65	318	2,66	
20:02:16	0,00	4,62	310	2,63	
20:02:46	0,00	4,74	308	2,72	
20:03:16	0,00	4,65	308	2,84	
20:03:46	0,00	4,65	308	2,75	
20:04:16	0,00	4,65	308	2,72	
20:04:46	0,00	4,77	308	2,66	
20:05:16	0,00	4,65	314	2,63	
20:05:46	0,00	4,62	308	2,63	
20:06:16	0,00	4,62	310	2,84	
20:06:46	0,00	4,65	310	2,78	
20:07:16	0,00	4,65	310	2,75	
20:07:46	0,00	4,65	308	2,69	
20:08:16	0,00	4,62	308	2,69	
20:08:46	0,00	4,62	308	2,63	
20:09:16	0,00	4,65	308	2,78	
20:09:46	0,00	4,65	308	2,81	
20:10:46	0,00	4,65	310	2,72	
20:11:16	0,00	4,65	310	2,69	
20:11:46	0,00	4,62	310	2,63	
20:12:16	0,00	4,62	310	2,69	
20:13:16	0,00	4,62	310	2,78	
20:13:46	0,00	4,65	308	2,72	
20:14:16	0,00	4,65	308	2,69	
20:14:46	0,00	4,62	308	2,66	
20:15:46	0,00	4,77	308	2,84	
20:16:16	0,00	4,65	310	2,78	
20:16:46	0,00	4,65	318	2,75	
20:17:16	0,00	4,65	316	2,72	
20:17:46	0,00	4,71	308	2,66	
20:18:16	0,00	0,00	0,00	2,63	
20:18:46	0,00	0,00	0,00	2,63	

Time hh:mm:ss	Xe Feed Unit Input	Primary Xe Feed Branch	Redundant Xe Feed Branch	Xe Storage Unit 1	Xe Storage Unit 2	Xe Storage Unit 3	Xe Feed Unit	Thruster Unit 4
	Pressure (kgf/cm <sup>2</sup> )			Temperature (°C)				
19:01:24	59,00	4,88	3,95	10,63	11,15	11,68	9,53	16,01
19:53:39	59,00	4,88	3,95	10,63	11,15	11,68	9,53	19,34
20:12:19	59,00	4,81	3,95	10,63	11,15	11,68	9,53	19,34
20:12:54	59,00	4,95	3,95	10,63	11,15	11,68	9,53	19,34
20:15:31	59,00	4,74	3,95	10,63	11,15	11,68	9,53	19,34
20:15:55	59,00	4,88	3,95	10,63	11,15	11,68	9,53	19,34

**Annex 4. T4C1 Thruster Operation TM-data based on available TM-data receipt sessions (15/11/00)**

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
16:52:44	0,00	0,00	0,00	2,81	
16:52:54	0,00	0,00	0,00	2,81	
16:53:04	0,00	0,00	0,00	2,81	
16:53:14	0,00	0,00	0,00	2,81	
16:53:24	0,00	0,00	0,00	2,81	
16:53:34	0,00	0,00	0,00	2,81	
16:53:44	0,00	0,00	0,00	2,81	
16:53:54	0,00	0,00	0,00	2,81	
16:54:04	0,00	0,00	0,00	2,81	
16:54:14	0,00	0,00	0,00	2,81	
16:54:24	0,00	0,00	326	2,81	
16:54:34	11,90	0,00	326	2,81	
16:54:44	12,00	0,00	326	2,81	
16:54:54	12,00	0,00	326	2,81	
16:55:04	12,00	0,00	326	2,81	
16:55:14	12,00	0,00	326	2,81	
16:55:24	11,90	0,00	326	2,81	
16:55:34	12,30	0,00	324	2,81	
16:55:45	12,10	0,00	326	2,81	
16:55:54	12,10	0,00	328	2,81	
16:56:04	12,00	0,00	326	2,81	
16:56:14	12,00	0,00	326	2,81	
16:56:24	12,00	0,00	326	2,81	
16:56:34	12,00	0,00	326	2,81	
16:56:44	12,00	0,00	328	2,81	
16:56:54	12,10	0,00	326	2,81	
16:57:04	12,20	0,00	326	2,81	
16:57:14	0,00	4,40	318	2,78	
16:57:44	0,00	4,65	308	2,75	
16:58:14	0,00	4,50	310	2,72	
16:58:44	0,00	4,59	310	2,66	
16:59:14	0,00	4,65	318	2,63	
16:59:44	0,00	4,65	308	2,63	
17:00:14	0,00	4,65	308	2,84	
17:00:44	0,00	4,71	308	2,78	
17:01:14	0,00	4,65	310	2,72	
17:01:44	0,00	4,68	308	2,72	
17:02:14	0,00	4,74	308	2,66	
17:02:44	0,00	4,68	318	2,63	
17:03:14	0,00	4,77	310	2,75	
17:03:44	0,00	4,65	316	2,81	
17:04:14	0,00	4,68	308	2,75	
17:04:44	0,00	4,62	310	2,72	
17:05:14	0,00	4,74	308	2,69	
17:05:44	0,00	4,68	318	2,63	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
17:06:14	0,00	4,65	310	2,72	
17:06:44	0,00	4,65	316	2,84	
17:07:14	0,00	4,65	312	2,78	
17:07:44	0,00	4,68	314	2,72	
17:08:14	0,00	4,65	314	2,69	
17:08:44	0,00	4,65	316	2,66	
17:09:14	0,00	4,65	318	2,63	
17:09:44	0,00	4,65	308	2,84	
17:10:14	0,00	4,68	310	2,78	
17:10:44	0,00	4,65	316	2,72	
17:11:14	0,00	4,62	310	2,69	
17:11:44	0,00	4,65	310	2,66	
17:12:14	0,00	4,65	310	2,63	
17:12:44	0,00	4,68	310	2,81	
17:13:14	0,00	4,65	318	2,81	
17:14:14	0,00	4,65	314	2,75	
17:14:44	0,00	4,77	308	2,69	
17:15:14	0,00	4,77	310	2,63	
17:15:44	0,00	4,65	316	2,72	
17:16:14	0,00	4,65	308	2,84	
17:16:44	0,00	4,62	310	2,75	
17:17:14	0,00	4,65	308	2,72	
17:17:44	0,00	4,77	308	2,69	
17:18:14	0,00	4,68	310	2,63	
17:18:44	0,00	4,65	308	2,63	
17:19:14	0,00	4,77	310	2,84	
17:19:44	0,00	4,65	310	2,78	
17:20:14	0,00	4,65	308	2,75	
17:20:44	0,00	4,68	310	2,72	
17:21:14	0,00	4,65	314	2,66	
17:21:44	0,00	4,71	310	2,63	
17:22:14	0,00	4,62	326	2,78	
17:22:44	0,00	4,68	314	2,81	
17:23:14	0,00	4,62	308	2,75	
17:23:44	0,00	4,65	310	2,72	
17:24:14	0,00	4,65	308	2,69	
17:24:44	0,00	4,62	310	2,63	
17:25:14	0,00	4,65	308	2,72	
17:25:44	0,00	4,68	308	2,84	
17:26:14	0,00	4,65	308	2,75	
17:26:44	0,00	4,62	310	2,72	
17:27:14	0,00	4,65	308	2,66	
17:27:44	0,00	4,65	316	2,66	
17:28:14	0,00	4,65	308	2,63	
17:28:44	0,00	4,71	308	2,84	
17:29:14	0,00	4,65	310	2,78	
17:29:44	0,00	4,65	316	2,75	
17:30:14	0,00	4,77	310	2,72	
17:30:44	0,00	4,65	314	2,69	
17:31:14	0,00	4,65	308	2,63	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
17:32:14	0,00	4,74	308	2,81	
17:32:44	0,00	4,77	308	2,75	
17:33:14	0,00	4,65	308	2,72	
17:33:44	0,00	4,65	318	2,66	
17:34:14	0,00	4,62	314	2,63	
17:34:44	0,00	4,65	308	2,72	
17:35:14	0,00	4,62	310	2,84	
17:35:44	0,00	4,71	308	2,75	
17:36:14	0,00	4,68	308	2,72	
17:36:44	0,00	4,68	310	2,69	
17:37:14	0,00	4,65	308	2,66	
17:37:44	0,00	4,65	316	2,63	
17:38:14	0,00	4,77	310	2,84	
17:38:44	0,00	4,87	308	2,78	
17:39:14	0,00	4,65	316	2,75	
17:39:44	0,00	4,65	308	2,72	
17:40:14	0,00	4,65	318	2,66	
17:40:44	0,00	4,71	308	2,63	
17:41:14	0,00	4,68	310	2,78	
17:41:44	0,00	4,62	310	2,84	
17:42:14	0,00	4,74	308	2,75	
17:42:44	0,00	4,71	310	2,72	
17:43:14	0,00	4,71	308	2,66	
17:43:44	0,00	4,77	310	2,63	
17:44:14	0,00	4,77	308	2,72	
17:44:44	0,00	4,65	308	2,84	
17:45:14	0,00	4,62	310	2,78	
17:45:44	0,00	4,71	308	2,72	
17:46:14	0,00	4,65	318	2,69	
17:46:44	0,00	4,65	308	2,66	
17:47:14	0,00	4,65	308	2,63	
17:47:44	0,00	4,65	316	2,87	
17:48:14	0,00	4,65	308	2,78	
17:48:44	0,00	4,68	314	2,72	
17:49:14	0,00	4,65	308	2,72	
17:50:14	0,00	4,62	310	2,63	
17:50:44	0,00	4,77	310	2,75	
17:51:14	0,00	4,62	310	2,84	
17:51:44	0,00	4,62	308	2,72	
17:52:14	0,00	4,62	314	2,72	
17:52:44	0,00	4,71	308	2,66	
17:53:14	0,00	4,62	308	2,63	
17:53:44	0,00	4,65	316	2,69	
17:54:14	0,00	4,62	326	2,84	
17:54:44	0,00	4,71	308	2,78	
17:55:14	0,00	4,62	326	2,75	
17:55:44	0,00	4,74	308	2,69	
17:56:14	0,00	4,62	318	2,66	
17:56:44	0,00	4,74	308	2,60	
17:57:14	0,00	4,65	310	2,84	



Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
17:57:44	0,00	4,65	314	2,78	
17:58:14	0,00	4,62	310	2,75	
17:58:44	0,00	4,87	310	2,72	
17:59:14	0,00	4,65	310	2,66	
17:59:44	0,00	4,77	308	2,63	
18:00:14	0,00	4,62	310	2,75	
18:00:44	0,00	4,68	310	2,84	
18:01:14	0,00	4,65	310	2,75	
18:01:44	0,00	4,74	308	2,72	
18:02:14	0,00	4,65	308	2,66	
18:02:44	0,00	4,68	308	2,66	
18:03:14	0,00	4,77	310	2,63	
18:03:44	0,00	4,65	316	2,84	
18:04:14	0,00	4,62	314	2,78	
18:04:44	0,00	4,74	308	2,75	
18:05:14	0,00	4,62	308	2,69	
18:05:44	0,00	4,65	308	2,69	
18:06:14	0,00	4,65	314	2,63	
18:06:44	0,00	4,65	308	2,81	
18:07:14	0,00	4,74	308	2,81	
18:08:14	0,00	4,65	318	2,72	
18:08:44	0,00	4,62	308	2,66	
18:09:14	0,00	4,62	310	2,63	
18:09:44	0,00	4,65	310	2,72	
18:10:14	0,00	4,62	308	2,84	
18:10:44	0,00	4,62	310	2,75	
18:11:14	0,00	4,65	316	2,72	
18:11:44	0,00	4,62	316	2,69	
18:12:14	0,00	4,62	308	2,66	
18:12:44	0,00	4,74	308	2,63	
18:13:14	0,00	4,65	308	2,84	
18:13:44	0,00	4,65	308	2,78	
18:14:14	0,00	4,65	316	2,75	
18:14:44	0,00	4,87	308	2,72	
18:15:14	0,00	4,62	312	2,66	
18:15:44	0,00	4,68	310	2,63	
18:16:14	0,00	4,65	316	2,75	
18:16:44	0,00	4,62	310	2,81	
18:17:14	0,00	4,74	308	2,75	
18:17:44	0,00	4,65	308	2,69	
18:18:14	0,00	4,65	308	2,69	
18:18:44	0,00	4,71	308	2,63	
18:19:14	0,00	4,68	308	2,69	
18:19:44	0,00	4,68	308	2,84	
18:20:14	0,00	4,68	308	2,78	
18:21:14	0,00	4,87	310	2,69	
18:21:44	0,00	4,65	308	2,66	
18:22:14	0,00	4,68	308	2,60	
18:22:44	0,00	4,65	310	2,84	
18:23:44	0,00	4,77	308	2,75	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
18:24:14	0,00	4,65	308	2,72	
18:24:44	0,00	4,65	316	2,69	
18:25:14	0,00	4,62	308	2,63	
18:26:14	0,00	4,62	318	2,84	
18:26:44	0,00	4,74	308	2,75	
18:27:14	0,00	4,68	310	2,72	
18:27:44	0,00	4,74	308	2,69	
18:28:14	0,00	4,65	310	2,66	
18:28:44	0,00	4,68	310	2,63	
18:29:14	0,00	4,77	308	2,84	
18:29:44	0,00	4,65	318	2,78	
18:30:14	0,00	4,65	308	2,78	
18:30:44	0,00	4,62	318	2,72	
18:31:14	0,00	4,65	314	2,66	
18:31:44	0,00	4,62	318	2,63	
18:32:14	0,00	4,77	308	2,78	
18:32:44	0,00	4,74	308	2,81	
18:33:14	0,00	4,77	310	2,75	
18:33:44	0,00	4,65	308	2,72	
18:34:14	0,00	4,65	310	2,66	
18:34:44	0,00	4,65	308	2,63	
18:35:14	0,00	4,74	308	2,69	
18:35:44	0,00	4,65	308	2,84	
18:36:14	0,00	4,74	310	2,78	
18:36:44	0,00	4,68	310	2,72	
18:37:14	0,00	4,68	310	2,69	
18:37:44	0,00	4,68	314	2,66	
18:38:14	0,00	4,65	308	2,63	
18:39:14	0,00	4,65	314	2,78	
18:39:44	0,00	4,62	308	2,78	
18:40:14	0,00	4,62	326	2,69	
18:40:44	0,00	4,65	316	2,69	
18:41:44	0,00	4,71	308	2,75	
18:42:14	0,00	4,65	310	2,84	
18:42:44	0,00	4,74	310	2,72	
18:43:14	0,00	4,77	310	2,72	
18:44:14	0,00	4,62	308	2,63	
18:44:44	0,00	4,77	308	2,63	
18:45:14	0,00	4,62	308	2,84	
18:45:44	0,00	4,77	310	2,75	
18:46:14	0,00	4,68	310	2,75	
18:46:44	0,00	4,65	310	2,72	
18:47:14	0,00	4,68	308	2,69	
18:47:44	0,00	4,65	310	2,63	
18:48:14	0,00	4,65	305	2,81	
18:48:44	0,00	4,65	314	2,84	
18:49:14	0,00	4,77	308	2,75	
18:49:44	0,00	4,77	308	2,72	
18:50:14	0,00	4,65	310	2,66	
18:50:44	0,00	4,87	310	2,63	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
18:51:14	0,00	4,62	310	2,69	
18:51:44	0,00	4,65	314	2,84	
18:52:14	0,00	4,77	308	2,78	
18:52:44	0,00	4,74	308	2,72	
18:53:14	0,00	4,62	308	2,69	
18:53:44	0,00	4,65	308	2,66	
18:54:14	0,00	4,68	310	2,60	
18:54:44	0,00	4,68	310	2,84	
18:55:14	0,00	4,65	314	2,81	
18:55:44	0,00	4,62	308	2,75	
18:56:14	0,00	4,74	308	2,72	
18:57:14	0,00	0,00	0,00	2,63	
18:57:44	0,00	0,00	0,00	2,63	
18:58:14	0,00	0,00	0,00	2,63	
18:58:44	0,00	0,00	0,00	2,63	

Time hh:mm:ss	Xe Feed Unit Input	Primary Xe Feed Branch	Redundant Xe Feed Branch	Xe Storage Unit 1	Xe Storage Unit 2	Xe Storage Unit 3	Xe Feed Unit	Thruster Unit 4
	Pressure (kgf/cm <sup>2</sup> )			Temperature (°C)				
16:52:37	61,63	4,88	3,95	12,72	11,15	12,72	12,15	18,01
17:51:13	61,63	4,88	3,95	12,72	11,15	12,72	12,15	21,34
18:34:48	61,63	4,88	3,95	12,72	11,15	12,72	9,53	21,34
18:41:04	61,63	4,88	3,95	12,72	11,15	12,72	9,53	24,67
18:51:17	61,63	4,81	3,95	12,72	11,15	12,72	9,53	24,67
18:51:54	61,63	4,95	3,95	12,72	11,15	12,72	9,53	24,67
18:54:35	61,63	4,74	3,95	12,72	11,15	12,72	9,53	24,67
18:54:57	61,63	4,88	3,95	12,72	11,15	12,72	9,53	24,67

**Annex 5. T4C1 Thruster Operation TM-data based on available TM-data receipt sessions (25/11/00)**

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
17:24:08	0,00	0,00	0,00	2,78	
17:24:18	0,00	0,00	0,00	2,78	
17:24:28	0,00	0,00	0,00	2,78	
17:24:38	0,00	0,00	0,00	2,78	
17:24:48	0,00	0,00	0,00	2,78	
17:24:58	0,00	0,00	0,00	2,78	
17:25:08	0,00	0,00	0,00	2,78	
17:25:18	0,00	0,00	0,00	2,78	
17:25:28	0,00	0,00	0,00	2,78	
17:25:38	0,00	0,00	0,00	2,78	
17:25:48	0,00	0,00	0,00	2,78	
17:25:59	0,00	0,00	0,00	2,78	
17:26:08	0,00	0,00	0,00	2,78	
17:26:18	0,00	0,00	0,00	2,78	
17:26:28	0,00	0,00	0,00	2,78	
17:26:38	0,00	0,00	0,00	2,78	
17:26:48	0,00	0,00	0,00	2,78	
17:26:58	0,00	0,00	0,00	2,78	
17:27:09	0,00	0,00	0,00	2,78	
17:27:18	11,80	0,00	326	2,78	
17:27:28	12,00	0,00	326	2,78	
17:27:38	12,10	0,00	324	2,78	
17:27:48	12,00	0,00	326	2,78	
17:27:58	12,00	0,00	326	2,78	
17:28:08	11,90	0,00	326	2,78	
17:28:18	12,20	0,00	326	2,78	
17:28:28	12,10	0,00	326	2,78	
17:28:38	12,00	0,00	326	2,78	
17:28:48	12,00	0,00	326	2,78	
17:28:58	12,00	0,00	326	2,78	
17:29:08	12,00	0,00	326	2,78	
17:29:18	12,00	0,00	326	2,78	
17:29:28	12,20	0,00	326	2,78	
17:29:38	12,20	0,00	326	2,78	
17:29:48	12,30	0,00	326	2,78	
17:29:58	0,00	4,40	310	2,78	
17:30:08	0,00	4,87	308	2,78	
17:30:38	0,00	4,31	310	2,72	
17:31:08	0,00	4,65	308	2,72	
17:31:38	0,00	4,65	318	2,66	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
17:32:08	0,00	4,65	308	2,63	
17:32:38	0,00	4,62	308	2,75	
17:33:08	0,00	4,74	308	2,81	
17:33:38	0,00	4,77	308	2,75	
17:34:08	0,00	4,74	308	2,72	
17:34:38	0,00	4,65	316	2,66	
17:35:08	0,00	4,65	312	2,63	
17:35:38	0,00	4,65	308	2,69	
17:36:08	0,00	4,65	310	2,84	
17:36:38	0,00	4,65	314	2,78	
17:37:08	0,00	4,74	308	2,72	
17:37:38	0,00	4,65	314	2,69	
17:38:08	0,00	4,65	314	2,63	
17:38:38	0,00	4,71	310	2,60	
17:39:08	0,00	4,65	310	2,84	
17:39:38	0,00	4,65	308	2,78	
17:40:08	0,00	4,74	310	2,72	
17:40:38	0,00	4,77	310	2,72	
17:41:08	0,00	4,65	310	2,69	
17:41:38	0,00	4,62	314	2,63	
17:42:08	0,00	4,65	310	2,75	
17:42:38	0,00	4,65	310	2,81	
17:43:08	0,00	4,62	310	2,75	
17:43:38	0,00	4,65	316	2,72	
17:44:08	0,00	4,77	308	2,69	
17:44:38	0,00	4,77	310	2,63	
17:45:38	0,00	4,65	310	2,84	
17:46:08	0,00	4,65	316	2,78	
17:46:38	0,00	4,65	316	2,72	
17:47:08	0,00	4,65	308	2,69	
17:47:38	0,00	4,62	318	2,66	
17:48:08	0,00	4,65	308	2,60	
17:48:38	0,00	4,77	310	2,84	
17:49:08	0,00	4,68	310	2,81	
17:49:38	0,00	4,74	308	2,75	
17:50:08	0,00	4,68	310	2,72	
17:50:38	0,00	4,62	314	2,66	
17:51:08	0,00	4,68	310	2,63	
17:51:38	0,00	4,65	310	2,75	
17:52:08	0,00	4,65	316	2,84	
17:52:38	0,00	4,68	310	2,72	
17:53:08	0,00	4,77	310	2,72	
17:53:38	0,00	4,68	308	2,66	
17:54:08	0,00	4,77	310	2,66	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
17:54:38	0,00	4,65	308	2,63	
17:55:08	0,00	4,68	308	2,84	
17:55:38	0,00	4,65	316	2,78	
17:56:08	0,00	4,62	310	2,75	
17:56:38	0,00	4,68	318	2,72	
17:57:08	0,00	4,65	310	2,66	
17:57:38	0,00	4,65	308	2,63	
17:58:08	0,00	4,74	310	2,81	
17:58:38	0,00	4,68	310	2,78	
17:59:08	0,00	4,65	308	2,78	
17:59:38	0,00	4,77	310	2,72	
18:00:08	0,00	4,77	310	2,69	
18:00:38	0,00	4,65	310	2,63	
18:01:08	0,00	4,65	308	2,72	
18:01:38	0,00	4,74	308	2,84	
18:02:08	0,00	4,65	308	2,75	
18:02:38	0,00	4,65	310	2,72	
18:03:38	0,00	4,65	314	2,66	
18:04:08	0,00	4,65	310	2,63	
18:04:38	0,00	4,65	308	2,84	
18:05:08	0,00	4,71	308	2,78	
18:05:38	0,00	4,77	310	2,75	
18:06:08	0,00	4,65	308	2,72	
18:06:38	0,00	4,68	308	2,69	
18:07:08	0,00	4,62	310	2,63	
18:07:38	0,00	4,77	310	2,81	
18:08:08	0,00	4,74	308	2,81	
18:08:38	0,00	4,87	310	2,75	
18:09:08	0,00	4,62	310	2,72	
18:09:38	0,00	4,74	310	2,66	
18:10:08	0,00	4,65	318	2,63	
18:10:38	0,00	4,74	310	2,66	
18:11:08	0,00	4,65	316	2,84	
18:11:38	0,00	4,65	318	2,78	
18:12:08	0,00	4,87	310	2,72	
18:12:38	0,00	4,65	308	2,69	
18:13:08	0,00	4,65	308	2,66	
18:13:38	0,00	4,77	308	2,60	
18:14:08	0,00	4,68	310	2,84	
18:14:38	0,00	4,65	308	2,81	
18:15:08	0,00	4,65	310	2,75	
18:15:38	0,00	4,65	308	2,72	
18:16:08	0,00	4,65	308	2,66	
18:16:38	0,00	4,65	308	2,63	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
18:17:08	0,00	4,77	310	2,75	
18:17:38	0,00	4,77	310	2,84	
18:18:08	0,00	4,65	308	2,75	
18:19:08	0,00	4,62	318	2,69	
18:19:38	0,00	4,65	318	2,66	
18:20:08	0,00	4,87	310	2,66	
18:20:38	0,00	4,77	308	2,84	
18:21:38	0,00	4,65	318	2,72	
18:22:08	0,00	4,74	308	2,72	
18:22:38	0,00	4,71	308	2,66	
18:23:08	0,00	4,65	308	2,63	
18:23:38	0,00	4,77	308	2,81	
18:24:08	0,00	4,68	310	2,81	
18:24:38	0,00	4,62	310	2,75	
18:25:08	0,00	4,65	308	2,72	
18:25:38	0,00	4,65	310	2,66	
18:26:08	0,00	4,65	308	2,63	
18:26:38	0,00	4,65	314	2,72	
18:27:08	0,00	4,74	308	2,84	
18:27:38	0,00	4,74	308	2,78	
18:28:08	0,00	4,62	310	2,72	
18:28:38	0,00	4,77	308	2,69	
18:29:08	0,00	4,65	308	2,63	
18:29:38	0,00	4,62	310	2,60	
18:30:08	0,00	4,65	308	2,84	
18:30:38	0,00	4,62	310	2,81	
18:31:08	0,00	4,68	310	2,75	
18:31:38	0,00	4,74	310	2,72	
18:32:08	0,00	4,77	310	2,66	
18:32:38	0,00	4,62	308	2,63	
18:33:08	0,00	4,68	308	2,75	
18:33:38	0,00	4,74	308	2,84	
18:34:08	0,00	4,74	308	2,75	
18:34:38	0,00	4,65	308	2,72	
18:35:08	0,00	4,62	308	2,66	
18:35:38	0,00	4,62	310	2,63	
18:36:08	0,00	4,65	318	2,66	
18:37:08	0,00	4,77	308	2,78	
18:37:38	0,00	4,71	308	2,75	
18:38:08	0,00	4,62	308	2,72	
18:38:38	0,00	4,77	310	2,66	
18:39:38	0,00	4,65	308	2,78	
18:40:08	0,00	0,00	0,00	2,84	
18:40:38	0,00	0,00	0,00	2,87	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
18:41:08	0,00	0,00	0,00	2,84	

Time hh:mm:ss	Xe Feed Unit Input	Primary Xe Feed Branch	Redundant Xe Feed Branch	Xe Storage Unit 1	Xe Storage Unit 2	Xe Storage Unit 3	Xe Feed Unit	Thruster Unit 4
	Pressure (kgf/cm <sup>2</sup> )			Temperature (°C)				
17:11:04	61,63	5,03	4,02	12,20	11,68	13,77	12,15	18,68
17:32:42	61,63	4,67	4,02	12,20	11,68	13,77	12,15	18,68
17:54:11	61,63	5,03	4,02	12,20	11,68	13,77	12,15	18,68
17:54:59	61,63	4,67	4,02	12,20	11,68	13,77	12,15	18,68
18:03:52	61,63	5,03	4,02	12,20	11,68	13,77	12,15	18,68
18:19:31	61,63	5,03	4,02	12,20	11,68	13,77	12,15	22,00
18:29:51	61,63	4,81	4,02	12,20	11,68	13,77	12,15	22,00
18:30:32	61,63	4,95	4,02	12,20	11,68	13,77	12,15	22,00
18:33:10	61,63	4,74	4,02	12,20	11,68	13,77	12,15	22,00
18:33:16	61,63	4,67	4,02	12,20	11,68	13,77	12,15	22,00
18:33:27	61,63	4,88	4,02	12,20	11,68	13,77	12,15	22,00
18:36:20	61,63	4,74	4,02	12,20	11,68	13,77	12,15	22,00
18:36:41	61,63	4,88	4,02	12,20	11,68	13,77	12,15	22,00
18:37:56	61,63	4,67	4,02	12,20	11,68	13,77	9,53	22,00



**Annex 6. RT4C1 Thruster Operation TM-data based on available TM-data receipt sessions (29/11/00)**

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
16:44:14	0,00	0,00	0,00	2,84	
16:44:24	0,00	0,00	0,00	2,84	
16:44:34	0,00	0,00	0,00	2,84	
16:44:44	0,00	0,00	0,00	2,84	
16:44:54	0,00	0,00	0,00	2,84	
16:45:04	0,00	0,00	0,00	2,84	
16:45:14	0,00	0,00	0,00	2,84	
16:45:24	0,00	0,00	0,00	2,84	
16:45:34	0,00	0,00	0,00	2,84	
16:45:44	0,00	0,00	0,00	2,84	
16:45:54	0,00	0,00	0,00	2,84	
16:46:04	0,00	0,00	0,00	2,84	
16:46:14	0,00	0,00	0,00	2,84	
16:46:24	0,00	0,00	0,00	2,84	
16:46:34	0,00	0,00	0,00	2,84	
16:46:44	0,00	0,00	0,00	2,84	
16:46:54	0,00	0,00	0,00	2,84	
16:47:04	0,00	0,00	0,00	2,84	
16:47:14	12,10	0,00	322	2,84	
16:47:24	12,00	0,00	324	2,84	
16:47:34	12,00	0,00	322	2,84	
16:47:44	12,00	0,00	320	2,84	
16:47:54	12,00	0,00	322	2,84	
16:48:05	11,90	0,00	322	2,84	
16:48:14	12,00	0,00	322	2,84	
16:48:24	12,00	0,00	322	2,84	
16:48:34	11,90	0,00	322	2,84	
16:48:44	12,30	0,00	320	2,84	
16:48:54	12,30	0,00	322	2,84	
16:49:04	12,10	0,00	322	2,84	
16:49:14	12,10	0,00	322	2,84	
16:49:24	12,10	0,00	322	2,84	
16:49:34	12,00	0,00	322	2,84	
16:49:44	12,00	0,00	322	2,84	
16:49:54	0,00	3,85	310	2,81	
16:50:04	0,00	4,59	312	2,78	
16:51:04	0,00	4,46	308	2,72	
16:51:34	0,00	4,65	308	2,69	
16:52:04	0,00	4,68	308	2,63	
16:52:34	0,00	4,65	308	2,75	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
16:53:04	0,00	4,65	308	2,84	
16:53:34	0,00	4,65	308	2,75	
16:54:04	0,00	4,65	310	2,72	
16:54:34	0,00	4,65	308	2,66	
16:55:04	0,00	4,62	308	2,63	
16:55:34	0,00	4,62	310	2,66	
16:56:04	0,00	4,62	308	2,84	
16:56:34	0,00	4,62	308	2,78	
16:57:04	0,00	4,65	308	2,72	
16:57:34	0,00	4,65	318	2,69	
16:58:04	0,00	4,65	308	2,63	
16:58:34	0,00	4,62	308	2,60	
16:59:04	0,00	4,62	308	2,84	
16:59:34	0,00	4,65	308	2,78	
17:00:04	0,00	4,65	308	2,75	
17:00:34	0,00	4,65	310	2,72	
17:01:04	0,00	4,74	310	2,69	
17:01:34	0,00	4,62	314	2,63	
17:02:04	0,00	4,68	305	2,75	
17:02:34	0,00	4,65	308	2,81	
17:03:04	0,00	4,62	308	2,72	
17:03:34	0,00	4,62	305	2,72	
17:04:04	0,00	4,65	308	2,69	
17:04:34	0,00	4,65	308	2,63	
17:05:04	0,00	4,65	305	2,69	
17:05:34	0,00	4,68	310	2,84	
17:06:34	0,00	4,65	308	2,72	
17:07:04	0,00	4,65	308	2,69	
17:07:34	0,00	4,68	308	2,66	
17:08:04	0,00	4,62	308	2,60	
17:09:04	0,00	4,74	310	2,78	
17:09:34	0,00	4,65	308	2,75	
17:10:04	0,00	4,62	310	2,72	
17:10:34	0,00	4,62	308	2,66	
17:11:04	0,00	4,62	310	2,63	
17:11:34	0,00	4,62	310	2,78	
17:12:04	0,00	4,65	310	2,81	
17:12:34	0,00	4,62	308	2,75	
17:13:04	0,00	4,65	318	2,72	
17:13:34	0,00	4,62	318	2,69	
17:14:04	0,00	4,65	308	2,63	
17:14:34	0,00	4,65	308	2,72	
17:15:04	0,00	4,65	318	2,84	
17:15:34	0,00	4,65	308	2,75	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
17:16:04	0,00	4,62	305	2,69	
17:16:34	0,00	4,65	308	2,69	
17:17:04	0,00	4,65	308	2,66	
17:17:34	0,00	4,62	310	2,63	
17:18:04	0,00	4,62	308	2,84	
17:18:34	0,00	4,65	308	2,78	
17:19:04	0,00	4,62	308	2,75	
17:19:34	0,00	4,65	316	2,72	
17:20:04	0,00	4,65	308	2,66	
17:20:34	0,00	4,62	310	2,63	
17:21:04	0,00	4,62	308	2,78	
17:21:34	0,00	4,62	308	2,81	
17:22:04	0,00	4,74	310	2,75	
17:22:34	0,00	4,65	308	2,72	
17:23:04	0,00	4,65	308	2,66	
17:23:34	0,00	4,68	308	2,63	
17:24:34	0,00	4,62	308	2,84	
17:25:04	0,00	4,65	308	2,75	
17:25:34	0,00	4,65	308	2,72	
17:26:04	0,00	4,65	308	2,66	
17:27:04	0,00	4,65	308	2,63	
17:27:34	0,00	4,65	308	2,84	
17:28:04	0,00	4,62	308	2,78	
17:28:34	0,00	4,65	316	2,72	
17:29:04	0,00	4,62	308	2,69	
17:29:34	0,00	4,65	308	2,69	
17:30:04	0,00	4,65	310	2,63	
17:30:34	0,00	4,62	305	2,78	
17:31:04	0,00	4,65	308	2,81	
17:31:34	0,00	4,65	318	2,72	
17:32:04	0,00	4,62	310	2,72	
17:32:34	0,00	4,65	308	2,66	
17:33:04	0,00	4,59	308	2,66	
17:33:34	0,00	4,65	308	2,72	
17:34:04	0,00	4,62	308	2,84	
17:34:34	0,00	4,65	318	2,78	
17:35:04	0,00	4,65	310	2,72	
17:35:34	0,00	4,62	310	2,66	
17:36:04	0,00	4,62	308	2,66	
17:36:34	0,00	4,59	305	2,60	
17:37:04	0,00	4,77	308	2,84	
17:37:34	0,00	4,62	308	2,78	
17:38:04	0,00	4,68	308	2,75	
17:38:34	0,00	4,62	310	2,72	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
17:39:04	0,00	4,65	308	2,66	
17:39:34	0,00	4,65	310	2,63	
17:40:04	0,00	4,62	305	2,75	
17:40:34	0,00	4,62	308	2,81	
17:41:04	0,00	4,77	308	2,75	
17:41:34	0,00	4,62	308	2,69	
17:42:34	0,00	4,65	310	2,63	
17:43:04	0,00	4,62	310	2,69	
17:43:34	0,00	4,77	308	2,84	
17:44:04	0,00	4,62	308	2,78	
17:45:04	0,00	4,62	308	2,69	
17:45:34	0,00	4,65	308	2,66	
17:46:04	0,00	4,62	308	2,60	
17:46:34	0,00	4,65	308	2,84	
17:47:04	0,00	4,65	308	2,78	
17:47:34	0,00	4,62	308	2,75	
17:48:04	0,00	4,62	308	2,72	
17:48:34	0,00	4,62	308	2,69	
17:49:04	0,00	4,65	308	2,63	
17:49:34	0,00	4,62	308	2,75	
17:50:04	0,00	4,62	308	2,81	
17:50:34	0,00	4,65	316	2,75	
17:51:04	0,00	4,68	308	2,72	
17:51:34	0,00	4,65	318	2,66	
17:52:04	0,00	4,62	308	2,63	
17:52:34	0,00	4,62	318	2,66	
17:53:04	0,00	4,62	310	2,84	
17:53:34	0,00	4,65	316	2,78	
17:54:04	0,00	4,59	308	2,72	
17:54:34	0,00	4,65	310	2,69	
17:55:04	0,00	4,62	308	2,66	
17:55:34	0,00	4,65	308	2,60	
17:56:04	0,00	4,62	308	2,84	
17:56:34	0,00	4,74	310	2,78	
17:57:04	0,00	4,62	308	2,75	
17:57:34	0,00	4,65	308	2,72	
17:58:04	0,00	4,65	308	2,66	
17:58:34	0,00	4,62	308	2,63	
17:59:04	0,00	4,59	318	2,75	
17:59:34	0,00	4,62	308	2,84	
18:00:34	0,00	4,65	308	2,72	
18:01:04	0,00	4,65	310	2,66	
18:01:34	0,00	4,65	308	2,66	
18:02:04	0,00	4,62	308	2,66	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
18:03:04	0,00	4,62	308	2,78	
18:03:34	0,00	4,65	310	2,75	
18:04:04	0,00	4,62	310	2,72	
18:04:34	0,00	4,62	308	2,66	
18:05:04	0,00	4,65	305	2,63	
18:05:34	0,00	4,77	308	2,81	
18:06:04	0,00	4,62	310	2,81	
18:06:34	0,00	4,62	308	2,75	
18:07:04	0,00	4,65	308	2,72	
18:07:34	0,00	4,62	308	2,69	
18:08:04	0,00	4,65	308	2,63	
18:08:34	0,00	4,65	308	2,72	
18:09:04	0,00	4,62	310	2,84	
18:09:34	0,00	4,74	310	2,75	
18:10:04	0,00	4,62	308	2,69	
18:10:34	0,00	4,62	308	2,66	
18:11:04	0,00	4,65	308	2,63	
18:11:34	0,00	4,65	308	2,63	
18:12:04	0,00	4,65	308	2,84	
18:12:34	0,00	4,62	308	2,78	
18:13:04	0,00	4,65	308	2,75	
18:13:34	0,00	4,62	310	2,72	
18:14:04	0,00	4,65	308	2,69	
18:14:34	0,00	4,65	310	2,63	
18:15:04	0,00	4,62	308	2,78	
18:16:04	0,00	4,62	308	2,75	
18:16:34	0,00	4,65	308	2,72	
18:17:04	0,00	4,62	308	2,69	
18:17:34	0,00	4,65	318	2,63	
18:18:34	0,00	4,62	310	2,84	
18:19:04	0,00	4,62	308	2,78	
18:19:34	0,00	4,65	318	2,75	
18:20:04	0,00	4,62	310	2,69	
18:21:04	0,00	4,62	308	2,60	
18:21:34	0,00	4,65	308	2,84	
18:22:04	0,00	4,65	318	2,78	
18:22:34	0,00	4,65	308	2,72	
18:23:04	0,00	4,65	310	2,69	
18:23:34	0,00	4,65	308	2,69	
18:24:04	0,00	4,62	310	2,63	
18:24:34	0,00	4,65	305	2,75	
18:25:04	0,00	4,65	318	2,84	
18:25:34	0,00	4,65	308	2,75	
18:26:04	0,00	4,68	308	2,72	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
18:26:34	0,00	4,65	308	2,66	
18:27:04	0,00	4,65	308	2,63	
18:27:34	0,00	4,65	308	2,69	
18:28:04	0,00	4,65	308	2,84	
18:28:34	0,00	4,65	308	2,78	
18:29:04	0,00	4,65	308	2,75	
18:29:34	0,00	4,65	308	2,72	
18:30:04	0,00	4,65	308	2,66	
18:30:34	0,00	4,65	305	2,60	
18:31:04	0,00	4,65	308	2,81	
18:31:34	0,00	4,62	308	2,81	
18:32:04	0,00	4,62	308	2,75	
18:32:34	0,00	4,65	308	2,72	
18:33:04	0,00	4,74	310	2,69	
18:34:04	0,00	4,62	308	2,72	
18:34:34	0,00	4,65	312	2,84	
18:35:04	0,00	4,65	308	2,75	
18:35:34	0,00	4,65	310	2,72	
18:36:34	0,00	4,65	308	2,63	
18:37:04	0,00	4,65	308	2,60	
18:37:34	0,00	4,65	308	2,84	
18:38:04	0,00	4,62	308	2,81	
18:39:04	0,00	4,62	310	2,72	
18:39:34	0,00	4,65	308	2,69	
18:40:04	0,00	4,65	305	2,63	
18:40:34	0,00	4,62	308	2,75	
18:41:04	0,00	4,65	308	2,81	
18:42:04	0,00	4,65	318	2,72	
18:42:34	0,00	4,65	308	2,66	
18:43:04	0,00	4,62	308	2,63	
18:43:34	0,00	4,74	310	2,69	
18:44:04	0,00	4,65	308	2,84	
18:44:34	0,00	4,65	308	2,78	
18:45:04	0,00	4,65	308	2,75	
18:45:34	0,00	4,65	308	2,69	
18:46:04	0,00	4,65	314	2,66	
18:46:34	0,00	4,62	305	2,63	
18:47:04	0,00	4,65	308	2,81	
18:47:34	0,00	4,65	310	2,81	
18:48:04	0,00	4,62	310	2,75	
18:48:34	0,00	4,68	308	2,72	
18:49:04	0,00	4,62	310	2,66	
18:49:34	0,00	4,65	314	2,63	
18:50:04	0,00	0,00	0,00	2,60	

Time hh:mm:ss	Xe Feed Unit Input	Primary Xe Feed Branch	Redundant Xe Feed Branch	Xe Storage Unit 1	Xe Storage Unit 2	Xe Storage Unit 3	Xe Feed Unit	Thruster Unit 4
	Pressure (kgf/cm <sup>2</sup> )			Temperature (°C)				
16:41:04	62,95	4,88	4,02	13,77	11,68	14,29	12,67	19,34
17:35:31	62,95	4,88	4,02	13,77	11,68	14,29	12,67	22,67
17:57:33	62,95	4,88	4,02	13,77	11,68	14,29	10,05	22,67
18:13:54	62,95	4,88	4,02	13,77	11,68	14,29	10,05	24,67
18:38:45	62,95	4,88	4,02	11,15	11,68	14,29	10,05	24,67
18:40:25	62,95	4,81	4,02	11,15	11,68	14,29	10,05	24,67
18:41:04	62,95	4,95	4,02	11,15	11,68	14,29	10,05	24,67
18:43:46	62,95	4,74	4,02	11,15	11,68	14,29	10,05	24,67
18:44:04	62,95	4,88	4,02	11,15	11,68	14,29	10,05	24,67
18:46:20	62,95	4,88	4,02	11,15	11,68	14,29	10,05	26,00
18:46:59	62,95	4,67	4,02	11,15	11,68	14,29	10,05	24,67
18:47:25	62,95	4,88	4,02	11,15	11,68	14,29	10,05	24,67

**Annex 7. RT1C1 Thruster Operation TM-data based on available TM-data receipt sessions (04/12/00)**

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
18:44:04	0,00	0,00	0,00	2,81	
18:44:14	0,00	0,00	0,00	2,81	
18:44:24	0,00	0,00	0,00	2,81	
18:44:34	0,00	0,00	0,00	2,81	
18:44:44	0,00	0,00	0,00	2,81	
18:44:54	0,00	0,00	0,00	2,81	
18:45:04	0,00	0,00	0,00	2,81	
18:45:14	0,00	0,00	0,00	2,81	
18:45:24	0,00	0,00	0,00	2,81	
18:45:34	0,00	0,00	0,00	2,81	
18:45:44	0,00	0,00	0,00	2,81	
18:45:54	0,00	0,00	0,00	2,81	
18:46:04	0,00	0,00	0,00	2,81	
18:46:14	0,00	0,00	0,00	2,81	
18:46:25	0,00	0,00	0,00	2,81	
18:46:34	0,00	0,00	0,00	2,81	
18:46:44	0,00	0,00	0,00	2,81	
18:46:54	0,00	0,00	0,00	2,81	
18:47:04	0,00	0,00	0,00	2,81	
18:47:14	12,00	0,00	322	2,81	
18:47:24	12,00	0,00	322	2,81	
18:47:34	12,00	0,00	322	2,81	
18:47:44	11,90	0,00	322	2,81	
18:47:54	12,00	0,00	322	2,81	
18:48:04	12,00	0,00	322	2,81	
18:48:14	12,00	0,00	320	2,81	
18:48:24	12,20	0,00	322	2,81	
18:48:34	12,10	0,00	324	2,81	
18:48:44	12,10	0,00	322	2,81	
18:48:55	12,00	0,00	322	2,81	
18:49:04	12,00	0,00	322	2,81	
18:49:14	11,90	0,00	322	2,81	
18:49:24	11,90	0,00	324	2,81	
18:49:34	12,00	0,00	322	2,81	
18:49:44	12,00	3,40	308	2,81	
18:49:54	0,00	4,37	308	2,78	
18:50:04	0,00	4,65	308	2,75	
18:50:34	0,00	4,62	310	2,72	
18:51:04	0,00	4,65	308	2,69	
18:52:04	0,00	4,59	310	2,81	



Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
18:52:34	0,00	4,62	308	2,75	
18:53:04	0,00	4,65	308	2,72	
18:53:34	0,00	4,62	308	2,69	
18:54:34	0,00	4,65	308	2,63	
18:55:04	0,00	4,65	308	2,81	
18:55:34	0,00	4,59	310	2,78	
18:56:04	0,00	4,62	305	2,72	
18:57:04	0,00	4,62	310	2,66	
18:57:34	0,00	4,62	308	2,63	
18:58:04	0,00	4,65	305	2,84	
18:58:34	0,00	4,62	308	2,81	
18:59:04	0,00	4,65	310	2,75	
18:59:34	0,00	4,65	308	2,72	
19:00:04	0,00	4,62	308	2,66	
19:00:34	0,00	4,77	308	2,63	
19:01:04	0,00	4,65	308	2,75	
19:01:34	0,00	4,74	308	2,84	
19:02:04	0,00	4,62	308	2,75	
19:02:34	0,00	4,62	310	2,72	
19:03:04	0,00	4,71	308	2,66	
19:03:34	0,00	4,62	308	2,63	
19:04:04	0,00	4,65	308	2,66	
19:04:34	0,00	4,62	308	2,84	
19:05:04	0,00	4,65	314	2,78	
19:05:34	0,00	4,65	316	2,72	
19:06:04	0,00	4,59	308	2,69	
19:06:34	0,00	4,62	308	2,66	
19:07:04	0,00	4,62	308	2,60	
19:07:34	0,00	4,62	308	2,84	
19:08:04	0,00	4,65	308	2,81	
19:08:34	0,00	4,62	310	2,75	
19:09:04	0,00	4,62	318	2,72	
19:10:04	0,00	4,65	308	2,63	
19:10:34	0,00	4,77	308	2,75	
19:11:04	0,00	4,65	316	2,81	
19:11:34	0,00	4,62	310	2,75	
19:12:34	0,00	4,65	308	2,69	
19:13:04	0,00	4,65	310	2,63	
19:13:34	0,00	4,62	308	2,66	
19:14:04	0,00	4,65	310	2,84	
19:15:04	0,00	4,62	308	2,72	
19:15:34	0,00	4,62	308	2,69	
19:16:04	0,00	4,65	308	2,66	
19:16:34	0,00	4,62	310	2,60	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
19:17:04	0,00	4,62	310	2,84	
19:17:34	0,00	4,68	308	2,78	
19:18:04	0,00	4,65	318	2,75	
19:18:34	0,00	4,65	308	2,69	
19:19:04	0,00	4,59	310	2,66	
19:19:34	0,00	4,59	308	2,63	
19:20:04	0,00	4,68	305	2,75	
19:20:34	0,00	4,62	308	2,81	
19:21:04	0,00	4,59	308	2,75	
19:21:34	0,00	4,62	308	2,69	
19:22:04	0,00	4,65	310	2,69	
19:22:34	0,00	4,65	308	2,63	
19:23:04	0,00	4,74	310	2,66	
19:23:34	0,00	4,65	308	2,84	
19:24:04	0,00	4,77	308	2,78	
19:24:34	0,00	4,62	308	2,72	
19:25:04	0,00	4,62	318	2,69	
19:25:34	0,00	4,62	308	2,63	
19:26:04	0,00	4,65	314	2,63	
19:26:34	0,00	4,62	308	2,81	
19:27:04	0,00	4,77	308	2,78	
19:28:04	0,00	4,65	308	2,72	
19:28:34	0,00	4,65	308	2,66	
19:29:04	0,00	4,77	308	2,63	
19:29:34	0,00	4,62	308	2,75	
19:30:34	0,00	4,62	308	2,75	
19:31:04	0,00	4,65	318	2,72	
19:31:34	0,00	4,77	308	2,66	
19:32:04	0,00	4,62	310	2,63	
19:33:04	0,00	4,65	314	2,84	
19:33:34	0,00	4,62	308	2,78	
19:34:04	0,00	4,62	310	2,75	
19:34:34	0,00	4,71	308	2,69	
19:35:04	0,00	4,74	308	2,66	
19:35:34	0,00	4,62	308	2,63	
19:36:04	0,00	4,71	308	2,84	
19:36:34	0,00	4,65	308	2,81	
19:37:04	0,00	4,59	318	2,75	
19:37:34	0,00	4,62	310	2,72	
19:38:04	0,00	4,74	310	2,66	
19:38:34	0,00	4,74	308	2,63	
19:39:04	0,00	4,62	310	2,75	
19:39:34	0,00	4,65	308	2,84	
19:40:04	0,00	4,65	316	2,75	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
19:40:34	0,00	4,65	308	2,72	
19:41:04	0,00	4,77	316	2,66	
19:41:34	0,00	4,65	318	2,66	
19:42:04	0,00	4,65	310	2,66	
19:42:34	0,00	4,65	310	2,84	
19:43:04	0,00	4,74	310	2,78	
19:43:34	0,00	4,71	310	2,72	
19:44:04	0,00	4,65	316	2,72	
19:44:34	0,00	4,59	308	2,66	
19:45:04	0,00	4,65	312	2,63	
19:46:04	0,00	4,65	308	2,81	
19:46:34	0,00	4,68	308	2,75	
19:47:04	0,00	4,68	308	2,72	
19:47:34	0,00	4,65	308	2,69	
19:48:34	0,00	4,65	310	2,72	
19:49:04	0,00	4,62	308	2,84	
19:49:34	0,00	4,62	308	2,75	
19:50:04	0,00	4,65	308	2,69	
19:51:04	0,00	4,65	308	2,66	
19:51:34	0,00	4,65	308	2,63	
19:52:04	0,00	4,62	308	2,84	
19:52:34	0,00	4,62	308	2,78	
19:53:04	0,00	4,65	318	2,72	
19:53:34	0,00	4,65	308	2,72	
19:54:04	0,00	4,62	308	2,66	
19:54:34	0,00	4,62	310	2,63	
19:55:04	0,00	4,59	308	2,78	
19:55:34	0,00	4,62	310	2,81	
19:56:04	0,00	4,68	310	2,75	
19:56:34	0,00	4,68	305	2,72	
19:57:04	0,00	4,59	310	2,69	
19:57:34	0,00	4,62	310	2,63	
19:58:04	0,00	4,62	308	2,72	
19:58:34	0,00	4,65	308	2,84	
19:59:04	0,00	4,65	318	2,78	
19:59:34	0,00	4,62	310	2,72	
20:00:04	0,00	4,62	308	2,69	
20:00:34	0,00	4,77	308	2,66	
20:01:04	0,00	4,62	308	2,60	
20:01:34	0,00	4,65	308	2,84	
20:02:04	0,00	4,68	310	2,78	
20:02:34	0,00	4,62	308	2,75	
20:03:04	0,00	4,65	308	2,72	
20:04:04	0,00	4,62	318	2,63	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
20:04:34	0,00	4,62	310	2,75	
20:05:04	0,00	4,62	308	2,81	
20:05:34	0,00	4,62	308	2,75	
20:06:34	0,00	4,68	308	2,66	
20:07:04	0,00	4,62	308	2,63	
20:07:34	0,00	4,62	308	2,66	
20:08:04	0,00	4,74	308	2,84	
20:09:04	0,00	4,65	316	2,72	
20:09:34	0,00	4,65	316	2,69	
20:10:04	0,00	4,62	308	2,63	
20:10:34	0,00	4,65	318	2,60	
20:11:04	0,00	4,62	308	2,84	
20:11:34	0,00	4,68	308	2,78	
20:12:04	0,00	4,62	318	2,75	
20:12:34	0,00	4,59	318	2,72	
20:13:04	0,00	4,65	308	2,66	
20:13:34	0,00	4,68	308	2,63	
20:14:04	0,00	4,62	305	2,75	
20:14:34	0,00	4,62	308	2,84	
20:15:04	0,00	0,00	0,00	2,78	
20:15:34	0,00	0,00	0,00	2,78	
20:16:04	0,00	0,00	0,00	2,78	

Time hh:mm:ss	Xe Feed Unit Input	Primary Xe Feed Branch	Redundant Xe Feed Branch	Xe Storage Unit 1	Xe Storage Unit 2	Xe Storage Unit 3	Xe Feed Unit	Thruster Unit 1
Pressure (kgf/cm <sup>2</sup> )				Temperature (°C)				
18:41:04	61,63	4,88	3,95	12,72	12,72	14,29	10,58	8,61
20:07:13	61,63	4,88	3,95	12,72	12,72	14,29	10,58	11,96
20:07:21	61,63	4,81	3,95	12,72	12,72	14,29	10,58	11,96
20:08:02	61,63	4,88	3,95	12,72	12,72	14,29	10,58	11,96
20:10:53	61,63	4,74	3,95	12,72	12,72	14,29	10,58	11,96
20:11:18	61,63	4,88	3,95	12,72	12,72	14,29	10,58	11,96
20:13:52	61,63	4,74	3,95	12,72	12,72	14,29	10,58	11,96
20:14:32	61,63	4,88	3,95	12,72	12,72	14,29	10,58	11,96

**Annex 8. RT2C1 Thruster Operation TM-data based on available TM-data receipt sessions (05/12/00)**

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
05:54:04	0,00	0,00	0,00	2,78	
05:54:14	0,00	0,00	0,00	2,78	
05:54:24	0,00	0,00	0,00	2,78	
05:54:34	0,00	0,00	0,00	2,78	
05:54:44	0,00	0,00	0,00	2,78	
05:54:54	0,00	0,00	0,00	2,78	
05:55:04	0,00	0,00	0,00	2,78	
05:55:14	0,00	0,00	0,00	2,78	
05:55:24	0,00	0,00	0,00	2,78	
05:55:34	0,00	0,00	0,00	2,78	
05:55:44	0,00	0,00	0,00	2,78	
05:55:54	0,00	0,00	0,00	2,78	
05:56:04	0,00	0,00	0,00	2,78	
05:56:14	0,00	0,00	0,00	2,78	
05:56:24	0,00	0,00	0,00	2,78	
05:56:34	0,00	0,00	0,00	2,78	
05:56:44	0,00	0,00	0,00	2,78	
05:56:54	0,00	0,00	0,00	2,78	
05:57:04	0,00	0,00	0,00	2,78	
05:57:14	12,00	0,00	322	2,78	
05:57:24	12,00	0,00	322	2,78	
05:57:34	12,00	0,00	322	2,78	
05:57:44	11,90	0,00	322	2,78	
05:57:54	12,00	0,00	322	2,78	
05:58:04	12,00	0,00	322	2,78	
05:58:14	12,20	0,00	322	2,78	
05:58:24	12,10	0,00	322	2,78	
05:58:34	12,00	0,00	322	2,78	
05:58:44	12,00	0,00	322	2,78	
05:58:54	11,90	0,00	322	2,78	
05:59:04	11,90	0,00	322	2,78	
05:59:14	11,90	0,00	322	2,78	
05:59:24	12,00	0,00	322	2,78	
05:59:34	12,00	0,00	322	2,78	
05:59:44	12,10	0,00	322	2,78	
05:59:54	0,00	4,40	308	2,78	
06:00:04	0,00	4,65	308	2,78	
06:00:34	0,00	4,62	308	2,75	
06:01:04	0,00	4,65	310	2,72	
06:01:34	0,00	4,65	308	2,69	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
06:02:04	0,00	4,71	308	2,63	
06:03:04	0,00	4,68	308	2,84	
06:03:34	0,00	4,62	308	2,75	
06:04:04	0,00	4,65	308	2,72	
06:04:34	0,00	4,62	310	2,66	
06:05:04	0,00	4,62	308	2,66	
06:05:34	0,00	4,65	305	2,63	
06:06:04	0,00	4,62	308	2,84	
06:06:34	0,00	4,65	308	2,78	
06:07:04	0,00	4,65	305	2,72	
06:07:34	0,00	4,62	310	2,72	
06:08:04	0,00	4,65	305	2,66	
06:08:34	0,00	4,62	308	2,63	
06:09:04	0,00	4,62	305	2,78	
06:09:34	0,00	4,65	308	2,81	
06:10:04	0,00	4,62	308	2,75	
06:10:34	0,00	4,62	308	2,72	
06:11:04	0,00	4,65	308	2,66	
06:11:34	0,00	4,71	310	2,63	
06:12:04	0,00	4,59	308	2,66	
06:12:34	0,00	4,68	308	2,84	
06:13:04	0,00	4,65	314	2,78	
06:13:34	0,00	4,65	308	2,72	
06:14:04	0,00	4,65	308	2,69	
06:14:34	0,00	4,65	308	2,63	
06:15:04	0,00	4,65	310	2,63	
06:16:04	0,00	4,62	310	2,81	
06:16:34	0,00	4,65	314	2,75	
06:17:04	0,00	4,68	308	2,72	
06:17:34	0,00	4,68	305	2,69	
06:18:04	0,00	4,74	310	2,63	
06:18:34	0,00	4,65	308	2,72	
06:19:04	0,00	4,62	308	2,84	
06:19:34	0,00	4,65	308	2,75	
06:20:04	0,00	4,77	308	2,72	
06:21:04	0,00	4,65	308	2,66	
06:21:34	0,00	4,65	308	2,63	
06:22:04	0,00	4,65	310	2,84	
06:22:34	0,00	4,65	314	2,78	
06:23:04	0,00	4,65	310	2,75	
06:23:34	0,00	4,59	310	2,72	
06:24:04	0,00	4,74	310	2,66	
06:24:34	0,00	4,59	308	2,63	
06:25:04	0,00	4,62	305	2,78	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
06:25:34	0,00	4,65	308	2,81	
06:26:04	0,00	4,74	308	2,75	
06:26:34	0,00	4,65	308	2,72	
06:27:04	0,00	4,71	308	2,66	
06:27:34	0,00	4,68	308	2,63	
06:28:04	0,00	4,71	308	2,66	
06:28:34	0,00	4,62	308	2,84	
06:29:04	0,00	4,62	310	2,78	
06:29:34	0,00	4,62	310	2,75	
06:30:04	0,00	4,62	310	2,72	
06:30:34	0,00	4,62	310	2,66	
06:31:04	0,00	4,71	308	2,63	
06:31:34	0,00	4,77	308	2,81	
06:32:04	0,00	4,62	310	2,81	
06:32:34	0,00	4,65	310	2,75	
06:33:04	0,00	4,62	308	2,72	
06:33:34	0,00	4,59	310	2,66	
06:34:04	0,00	4,77	308	2,63	
06:34:34	0,00	4,71	308	2,66	
06:35:04	0,00	4,68	308	2,84	
06:35:34	0,00	4,62	305	2,78	
06:36:04	0,00	4,65	308	2,72	
06:36:34	0,00	4,62	310	2,69	
06:37:04	0,00	4,77	308	2,66	
06:37:34	0,00	4,62	310	2,63	
06:38:04	0,00	4,65	308	2,84	
06:39:04	0,00	4,68	308	2,75	
06:39:34	0,00	4,65	310	2,72	
06:40:04	0,00	4,59	314	2,69	
06:40:34	0,00	4,65	310	2,63	
06:41:04	0,00	4,65	305	2,72	
06:41:34	0,00	4,65	308	2,84	
06:42:04	0,00	4,62	308	2,75	
06:42:34	0,00	4,62	308	2,72	
06:43:04	0,00	4,71	308	2,69	
06:43:34	0,00	4,62	310	2,66	
06:44:04	0,00	4,65	305	2,63	
06:44:34	0,00	4,62	310	2,84	
06:45:04	0,00	4,65	308	2,78	
06:45:34	0,00	4,59	308	2,75	
06:46:04	0,00	4,68	305	2,72	
06:46:34	0,00	4,62	303	2,66	
06:47:04	0,00	4,65	308	2,63	
06:47:34	0,00	4,65	305	2,75	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
06:48:04	0,00	4,65	316	2,84	
06:48:34	0,00	4,62	308	2,75	
06:49:04	0,00	4,62	308	2,72	
06:49:34	0,00	4,65	308	2,66	
06:50:04	0,00	4,62	310	2,66	
06:50:34	0,00	4,62	305	2,63	
06:51:04	0,00	4,62	308	2,84	
06:51:34	0,00	4,62	314	2,78	
06:52:04	0,00	4,77	308	2,75	
06:52:34	0,00	4,62	305	2,72	
06:53:04	0,00	4,68	308	2,66	
06:53:34	0,00	4,62	308	2,63	
06:54:04	0,00	4,65	308	2,78	
06:54:34	0,00	4,65	308	2,81	
06:55:04	0,00	4,65	308	2,75	
06:55:34	0,00	4,62	308	2,72	
06:56:04	0,00	4,74	310	2,66	
06:57:04	0,00	4,68	308	2,69	
06:57:34	0,00	4,62	314	2,84	
06:58:04	0,00	4,65	314	2,75	
06:58:34	0,00	4,59	308	2,75	
06:59:04	0,00	4,65	305	2,72	
06:59:34	0,00	4,62	305	2,66	
07:00:04	0,00	4,68	308	2,63	
07:00:34	0,00	4,65	308	2,81	
07:01:04	0,00	4,62	308	2,81	
07:01:34	0,00	4,59	310	2,75	
07:02:04	0,00	4,62	308	2,69	
07:02:34	0,00	4,59	310	2,69	
07:03:04	0,00	4,65	308	2,63	
07:03:34	0,00	4,68	305	2,69	
07:04:04	0,00	4,62	310	2,81	
07:04:34	0,00	4,65	308	2,78	
07:05:04	0,00	4,65	308	2,72	
07:05:34	0,00	4,71	308	2,69	
07:06:04	0,00	4,62	308	2,66	
07:06:34	0,00	4,62	308	2,63	
07:07:04	0,00	4,62	305	2,84	
07:07:34	0,00	4,62	308	2,81	
07:08:04	0,00	4,62	310	2,75	
07:09:04	0,00	4,68	308	2,69	
07:09:34	0,00	4,65	314	2,63	
07:10:04	0,00	4,65	314	2,72	
07:10:34	0,00	4,65	314	2,84	



Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
07:11:04	0,00	4,62	308	2,78	
07:11:34	0,00	4,62	308	2,72	
07:12:04	0,00	4,77	308	2,69	
07:12:34	0,00	4,65	316	2,66	
07:13:04	0,00	4,65	308	2,60	
07:13:34	0,00	4,62	310	2,84	
07:14:04	0,00	4,65	308	2,81	
07:15:04	0,00	4,65	314	2,72	
07:15:34	0,00	4,65	308	2,66	
07:16:04	0,00	4,65	316	2,63	
07:16:34	0,00	4,62	305	2,72	
07:17:04	0,00	4,62	308	2,84	
07:17:34	0,00	4,68	308	2,75	
07:18:04	0,00	4,65	308	2,72	
07:18:34	0,00	4,62	310	2,69	
07:19:04	0,00	4,71	308	2,63	
07:19:34	0,00	4,65	318	2,63	
07:20:04	0,00	4,65	308	2,84	
07:20:34	0,00	4,62	308	2,78	
07:21:04	0,00	4,65	308	2,75	
07:21:34	0,00	4,65	308	2,72	
07:22:04	0,00	4,65	314	2,66	
07:22:34	0,00	4,65	308	2,63	
07:23:04	0,00	4,65	318	2,75	
07:23:34	0,00	4,62	318	2,84	
07:24:04	0,00	4,62	308	2,75	
07:24:34	0,00	4,65	308	2,72	
07:25:04	0,00	4,68	308	2,69	
07:25:34	0,00	4,62	308	2,63	
07:26:04	0,00	4,65	308	2,63	
07:26:34	0,00	4,71	308	2,84	
07:27:04	0,00	4,77	308	2,78	
07:27:34	0,00	4,62	308	2,75	
07:28:04	0,00	4,62	308	2,72	
07:28:34	0,00	4,74	310	2,66	
07:29:04	0,00	4,62	305	2,63	
07:29:34	0,00	4,65	318	2,75	
07:30:04	0,00	0,00	0,00	2,84	
07:30:34	0,00	0,00	0,00	2,84	
07:35:04	0,00	0,00	0,00	2,84	
07:35:34	0,00	0,00	0,00	2,84	

Time hh:mm:ss	Xe Feed Unit Input	Primary Xe Feed Branch	Redundant Xe Feed Branch	Xe Storage Unit 1	Xe Storage Unit 2	Xe Storage Unit 3	Xe Feed Unit	Thruster Unit 2
	Pressure (kgf/cm <sup>2</sup> )			Temperature (°C)				
05:51:04	61,63	4,88	3,95	10,10	13,25	13,25	7,43	8,61
07:05:37	61,63	4,88	3,95	10,10	13,25	13,25	7,43	11,96
07:23:49	61,63	4,88	3,95	10,10	13,25	13,25	10,05	11,96
07:26:15	61,63	4,74	3,95	10,10	13,25	13,25	10,05	11,96
07:26:42	61,63	4,88	3,95	10,10	13,25	13,25	10,05	11,96
07:29:38	61,63	4,67	3,95	10,10	13,25	13,25	10,05	11,96

**Annex 9. RT4C1 Thruster Operation TM-data based on available TM-data receipt sessions (21/12/00)**

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
15:17:25	0,00	0,00	0,00	2,78	
15:17:35	0,00	0,00	0,00	2,78	
15:17:45	0,00	0,00	0,00	2,78	
15:17:55	0,00	0,00	0,00	2,78	
15:18:05	0,00	0,00	0,00	2,78	
15:18:15	0,00	0,00	0,00	2,78	
15:18:25	0,00	0,00	0,00	2,78	
15:18:35	0,00	0,00	0,00	2,78	
15:18:45	0,00	0,00	0,00	2,78	
15:18:55	0,00	0,00	0,00	2,78	
15:19:05	0,00	0,00	0,00	2,78	
15:19:15	0,00	0,00	0,00	2,78	
15:19:25	0,00	0,00	330	2,78	
15:19:35	12,00	0,00	322	2,78	
15:19:45	11,90	0,00	322	2,78	
15:19:55	12,00	0,00	322	2,78	
15:20:06	12,00	0,00	322	2,78	
15:20:15	12,00	0,00	322	2,78	
15:20:25	11,90	0,00	322	2,78	
15:20:35	12,00	0,00	322	2,78	
15:20:45	12,00	0,00	324	2,78	
15:20:55	11,90	0,00	322	2,78	
15:21:05	12,30	0,00	322	2,78	
15:21:15	12,30	0,00	322	2,78	
15:21:25	12,20	0,00	322	2,78	
15:21:35	12,10	0,00	322	2,78	
15:21:45	12,00	0,00	322	2,78	
15:21:55	12,00	0,00	322	2,78	
15:22:05	0,00	3,43	310	2,78	
15:22:15	0,00	3,92	308	2,78	
15:22:25	0,00	4,68	308	2,78	
15:22:55	0,00	4,65	310	2,75	
15:23:25	0,00	4,65	310	2,72	
15:23:55	0,00	4,77	308	2,66	
15:24:25	0,00	4,22	314	2,63	
15:24:55	0,00	4,65	308	2,69	
15:25:25	0,00	4,65	308	2,84	
15:25:55	0,00	4,65	316	2,78	
15:26:25	0,00	4,65	308	2,69	
15:26:55	0,00	4,65	308	2,69	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
15:27:25	0,00	4,65	316	2,63	
15:27:55	0,00	4,62	305	2,63	
15:28:25	0,00	4,62	308	2,84	
15:28:55	0,00	4,65	310	2,78	
15:29:25	0,00	4,62	308	2,75	
15:29:55	0,00	4,77	308	2,72	
15:30:55	0,00	4,65	308	2,63	
15:31:25	0,00	4,65	305	2,78	
15:31:55	0,00	4,68	308	2,81	
15:32:25	0,00	4,62	314	2,75	
15:33:25	0,00	4,65	308	2,66	
15:33:55	0,00	4,65	308	2,63	
15:34:25	0,00	4,77	308	2,72	
15:34:55	0,00	4,62	308	2,84	
15:35:25	0,00	4,65	308	2,75	
15:35:55	0,00	4,65	308	2,72	
15:36:25	0,00	4,62	316	2,69	
15:36:55	0,00	4,77	308	2,66	
15:37:25	0,00	4,71	308	2,63	
15:37:55	0,00	4,65	308	2,84	
15:38:25	0,00	4,65	308	2,78	
15:38:55	0,00	4,71	310	2,72	
15:39:25	0,00	4,62	308	2,69	
15:39:55	0,00	4,62	308	2,63	
15:40:25	0,00	4,77	308	2,60	
15:40:55	0,00	4,62	310	2,84	
15:41:25	0,00	4,65	308	2,78	
15:41:55	0,00	4,65	308	2,75	
15:42:25	0,00	4,77	308	2,69	
15:42:55	0,00	4,65	308	2,69	
15:43:25	0,00	4,77	308	2,63	
15:43:55	0,00	4,65	314	2,75	
15:44:25	0,00	4,65	308	2,84	
15:44:55	0,00	4,77	308	2,75	
15:45:25	0,00	4,74	310	2,72	
15:45:55	0,00	4,62	310	2,66	
15:46:25	0,00	4,74	310	2,63	
15:46:55	0,00	4,65	305	2,72	
15:47:25	0,00	4,77	310	2,84	
15:47:55	0,00	4,65	308	2,78	
15:48:55	0,00	4,62	308	2,69	
15:49:25	0,00	4,65	305	2,63	
15:49:55	0,00	4,62	308	2,63	
15:50:25	0,00	4,62	308	2,84	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
15:51:25	0,00	4,65	310	2,72	
15:51:55	0,00	4,62	308	2,72	
15:52:25	0,00	4,62	308	2,66	
15:52:55	0,00	4,62	314	2,63	
15:53:25	0,00	4,65	308	2,78	
15:53:55	0,00	4,62	308	2,81	
15:54:25	0,00	4,77	308	2,75	
15:54:55	0,00	4,68	308	2,72	
15:55:25	0,00	4,77	308	2,66	
15:55:55	0,00	4,77	308	2,63	
15:56:25	0,00	4,62	310	2,72	
15:56:55	0,00	4,71	308	2,84	
15:57:25	0,00	4,59	308	2,75	
15:57:55	0,00	4,71	310	2,72	
15:58:25	0,00	4,62	310	2,66	
15:58:55	0,00	4,62	310	2,63	
15:59:25	0,00	4,65	310	2,66	
15:59:55	0,00	4,65	308	2,84	
16:00:25	0,00	4,65	308	2,78	
16:00:55	0,00	4,65	308	2,75	
16:01:25	0,00	4,71	310	2,72	
16:01:55	0,00	4,62	308	2,66	
16:02:25	0,00	4,71	308	2,63	
16:02:55	0,00	4,65	314	2,84	
16:03:25	0,00	4,65	310	2,81	
16:03:55	0,00	4,65	308	2,75	
16:04:25	0,00	4,65	308	2,72	
16:04:55	0,00	4,62	308	2,66	
16:05:25	0,00	4,62	310	2,63	
16:05:55	0,00	4,62	318	2,75	
16:06:55	0,00	4,59	310	2,75	
16:07:25	0,00	4,62	312	2,72	
16:07:55	0,00	4,77	308	2,69	
16:08:25	0,00	4,65	308	2,66	
16:09:25	0,00	4,65	308	2,84	
16:09:55	0,00	4,68	308	2,78	
16:10:25	0,00	4,62	314	2,72	
16:10:55	0,00	4,68	308	2,69	
16:11:25	0,00	4,65	308	2,63	
16:11:55	0,00	4,65	308	2,63	
16:12:25	0,00	4,62	308	2,84	
16:12:55	0,00	4,59	312	2,78	
16:13:25	0,00	4,65	308	2,75	
16:13:55	0,00	4,65	310	2,72	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
16:14:25	0,00	4,65	308	2,66	
16:14:55	0,00	4,62	308	2,60	
16:15:25	0,00	4,62	318	2,75	
16:15:55	0,00	4,65	316	2,81	
16:16:25	0,00	4,68	308	2,75	
16:16:55	0,00	4,65	318	2,72	
16:17:25	0,00	4,71	310	2,66	
16:17:55	0,00	4,71	310	2,63	
16:18:25	0,00	4,62	308	2,69	
16:18:55	0,00	4,62	310	2,84	
16:19:25	0,00	4,65	308	2,78	
16:19:55	0,00	4,65	308	2,72	
16:20:25	0,00	4,65	316	2,69	
16:20:55	0,00	4,65	308	2,66	
16:21:25	0,00	4,68	308	2,63	
16:21:55	0,00	4,62	310	2,84	
16:22:25	0,00	4,71	310	2,78	
16:22:55	0,00	4,62	310	2,75	
16:23:25	0,00	4,65	308	2,72	
16:23:55	0,00	4,62	310	2,69	
16:24:55	0,00	4,65	308	2,75	
16:25:25	0,00	4,71	305	2,81	
16:25:55	0,00	4,62	305	2,75	
16:26:25	0,00	4,65	316	2,72	
16:27:25	0,00	4,62	308	2,63	
16:27:55	0,00	4,65	308	2,69	
16:28:25	0,00	4,62	310	2,84	
16:28:55	0,00	4,62	308	2,78	
16:29:25	0,00	4,65	308	2,75	
16:29:55	0,00	4,62	310	2,72	
16:30:25	0,00	4,62	308	2,69	
16:30:55	0,00	4,65	308	2,63	
16:31:25	0,00	4,62	308	2,72	
16:31:55	0,00	4,65	308	2,84	
16:32:25	0,00	4,65	316	2,78	
16:32:55	0,00	4,77	308	2,72	
16:33:25	0,00	4,62	308	2,69	
16:33:55	0,00	4,65	308	2,63	
16:34:25	0,00	4,65	308	2,63	
16:34:55	0,00	4,65	308	2,84	
16:35:25	0,00	4,62	310	2,78	
16:35:55	0,00	4,62	308	2,75	
16:36:25	0,00	4,62	310	2,72	
16:36:55	0,00	4,65	308	2,66	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
16:37:25	0,00	4,65	308	2,63	
16:37:55	0,00	4,62	310	2,75	
16:38:25	0,00	4,62	308	2,81	
16:38:55	0,00	4,62	308	2,75	
16:39:25	0,00	4,62	308	2,69	
16:39:55	0,00	4,62	308	2,66	
16:40:25	0,00	4,62	310	2,63	
16:40:55	0,00	4,59	310	2,72	
16:41:25	0,00	4,62	308	2,84	
16:41:55	0,00	4,74	310	2,78	
16:42:55	0,00	4,62	308	2,69	
16:43:25	0,00	4,65	308	2,66	
16:43:55	0,00	4,65	308	2,63	
16:44:25	0,00	4,62	310	2,84	
16:45:25	0,00	4,62	308	2,72	
16:45:55	0,00	4,65	308	2,72	
16:46:25	0,00	4,62	308	2,66	
16:46:55	0,00	4,62	310	2,63	
16:47:25	0,00	4,65	305	2,81	
16:47:55	0,00	4,62	308	2,81	
16:48:25	0,00	4,65	308	2,75	
16:48:55	0,00	4,59	308	2,72	
16:49:25	0,00	4,65	314	2,66	
16:49:55	0,00	4,65	308	2,63	
16:50:25	0,00	4,62	305	2,72	
16:50:55	0,00	4,62	308	2,84	
16:51:25	0,00	4,62	310	2,75	
16:51:55	0,00	4,65	312	2,72	
16:52:25	0,00	4,62	305	2,69	
16:52:55	0,00	4,62	305	2,63	
16:53:25	0,00	4,65	305	2,63	
16:53:55	0,00	4,62	308	2,84	
16:54:25	0,00	4,62	308	2,78	
16:54:55	0,00	4,65	310	2,72	
16:55:25	0,00	4,62	314	2,72	
16:55:55	0,00	4,65	318	2,66	
16:56:25	0,00	4,62	308	2,63	
16:56:55	0,00	4,65	312	2,78	
16:57:25	0,00	4,74	310	2,81	
16:57:55	0,00	4,65	318	2,75	
16:58:25	0,00	4,65	308	2,72	
16:58:55	0,00	4,68	308	2,66	
16:59:25	0,00	4,59	310	2,63	
16:59:55	0,00	4,65	308	2,72	

Time, hh:mm:ss	Cathode Current, A	Anode Current, A	Anode Voltage, V	Xe Feed Unit Output, (kgf/sm <sup>2</sup> )	Comments
17:00:55	0,00	4,65	310	2,78	
17:01:25	0,00	4,65	308	2,72	
17:01:55	0,00	4,62	308	2,69	
17:02:25	0,00	4,62	310	2,66	
17:03:25	0,00	4,62	308	2,84	
17:03:55	0,00	4,65	308	2,78	
17:04:25	0,00	4,65	308	2,72	
17:04:55	0,00	4,62	305	2,72	
17:05:25	0,00	4,62	305	2,66	
17:05:55	0,00	4,77	312	2,63	
17:06:25	0,00	4,74	310	2,78	
17:06:55	0,00	4,62	308	2,81	
17:07:25	0,00	4,62	308	2,78	
17:07:55	0,00	4,62	310	2,72	
17:08:25	0,00	4,65	308	2,66	
17:08:55	0,00	4,62	310	2,63	
17:09:25	0,00	4,59	308	2,72	
17:09:55	0,00	4,65	308	2,84	
17:10:25	0,00	4,71	310	2,78	
17:10:55	0,00	4,62	308	2,72	
17:11:25	0,00	4,71	310	2,69	
17:11:55	0,00	4,65	314	2,63	
17:12:25	0,00	4,65	310	2,63	
17:12:55	0,00	4,65	308	2,84	
17:13:25	0,00	4,74	310	2,78	
17:13:55	0,00	4,62	318	2,75	
17:14:25	0,00	4,65	308	2,72	
17:14:55	0,00	4,62	310	2,66	
17:15:25	0,00	4,62	308	2,75	
17:15:55	0,00	4,65	308	2,78	
17:16:25	0,00	4,65	308	2,72	
17:16:55	0,00	4,65	308	2,72	
17:17:25	0,00	4,62	308	2,66	
17:17:55	0,00	4,62	308	2,63	
17:18:55	0,00	4,62	308	2,81	
17:19:25	0,00	4,65	316	2,75	
17:19:55	0,00	4,65	308	2,72	
17:20:25	0,00	4,59	310	2,69	
17:21:25	0,00	4,68	310	2,72	
17:21:55	0,00	4,62	308	2,84	
17:22:25	0,00	0,00	0,00	2,81	
17:22:55	0,00	0,00	0,00	2,81	
17:26:55	0,00	0,00	0,00	2,81	



Time hh:mm:ss	Xe Feed Unit Input	Primary Xe Feed Branch	Redundant Xe Feed Branch	Xe Storage Unit 1	Xe Storage Unit 2	Xe Storage Unit 3	Xe Feed Unit	Thruster Unit 4
	Pressure (kgf/cm <sup>2</sup> )			Temperature (°C)				
14:58:04	61,63	4,88	4,02	13,77	12,20	15,34	15,29	20,67
16:15:12	61,63	4,88	4,02	13,77	12,20	15,34	15,29	24,00
16:32:16	61,63	4,88	4,02	13,77	12,20	15,34	12,67	24,00
17:02:44	61,63	4,88	4,02	13,77	12,20	15,34	12,67	27,33
17:15:21	61,63	4,81	4,02	13,77	12,20	15,34	12,67	27,33
17:18:37	61,63	4,88	4,02	13,77	12,20	15,34	12,67	27,33
17:21:15	61,63	4,81	4,02	13,77	12,20	15,34	12,67	27,33

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE June 2003		3. REPORT TYPE AND DATES COVERED Final Contractor Report
4. TITLE AND SUBTITLE Hall Effect Thruster Interactions Data From the Russian Express-A2 and Express-A3 Satellites Acquire Express-A3 SPT-100 Based Propulsion Subsystem and Other Subsystem Flight Operation TM-Data for the Period of October 1, 2000 to and Including December 31, 2000, Task 31			5. FUNDING NUMBERS  WBS-22-800-91-01 NAS3-99151 NAS3-99204	
6. AUTHOR(S)  N. Sitnikova, D. Volkov, I. Maximov, V. Petrusevich, and D. Allen				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)  Nauchno-Proizvodstvennoe Obiedinenie Prikladnoi Mekhaniki (NPO PM) 52 Lenin Street, Zheleznogorsk-2 Krasnoyarsk region, 662990, Russia			8. PERFORMING ORGANIZATION REPORT NUMBER  E-13691-5	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)  National Aeronautics and Space Administration Washington, DC 20546-0001			10. SPONSORING/MONITORING AGENCY REPORT NUMBER  NASA CR-2003-212005-PART5	
11. SUPPLEMENTARY NOTES  N. Sitnikova, D. Volkov, I. Maximov, and V. Petrusevich, Nauchno-Proizvodstvennoe Obiedinenie Prikladnoi (NPO PM) 52 Lenin Street, Zheleznogorsk-2, Mekhaniki, Krasnoyarsk region, 662990, Russia. D. Allen, Schafer Corporation, 321 Billerica Road, Chelmsford, Massachusetts 01824-4191. Project Manager, John Dunning, Power and Propulsion Office, NASA Glenn Research Center, organization code 6900, 216-433-5298.				
12a. DISTRIBUTION/AVAILABILITY STATEMENT  Unclassified - Unlimited Subject Category: 20 Available electronically at <a href="http://gltrs.grc.nasa.gov">http://gltrs.grc.nasa.gov</a> This publication is available from the NASA Center for AeroSpace Information, 301-621-0390.			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)  This 12-part report documents the data obtained from various sensor measurements taken aboard the Russian Express-A2 and Express-A3 spacecraft in Geosynchronous Earth Orbit (GEO). These GEO communications satellites, which were designed and built by NPO Prikladnoy Mekhaniki (NPO PM) of Zheleznogorsk, Russia, utilize Hall thruster propulsion systems for north-south and east-west stationkeeping and as of June 2002, were still operating at 80° E. and 11° W., respectively. Express-A2 was launched on March 12, 2000, while Express-A3 was launched on June 24, 2000. The diagnostic equipment from which these data were taken includes electric field strength sensors, ion current and energy sensors, and pressure sensors. The diagnostics and the Hall thruster propulsion systems are described in detail along with lists of tabular data from those diagnostics and propulsion system and other satellite systems. Space Power, Inc., now part of Pratt & Whitney's Chemical Systems Division, under contract NAS3-99151 to the NASA Glenn Research Center, obtained these data over several periods from March 12, 2000, through September 30, 2001. Each of the 12 individual reports describe, in detail, the propulsion systems as well as the diagnostic sensors utilized. Finally, parts 11 and 12 include the requirements to which NPO PM prepared and delivered these data.				
14. SUBJECT TERMS  Propulsion; Electric propulsion; Hall thrusters; Hall effect			15. NUMBER OF PAGES 73	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT	